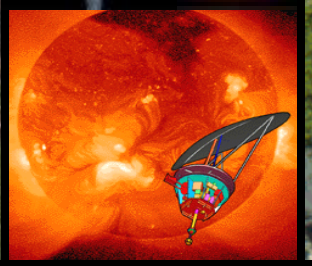





# NASA Deep Space Network

Presented to:

Space Communications Networks Conference

At NASA Wallops Flight Facility

June 24, 2004

Gene Burke
David Morris
Margaret Medina

NASA / Jet Propulsion Laboratory
California Institute of Technology, Pasadena CA



# DSN Overview


## Gene Burke

## AGENDA

- Organization Charts – JPL
- DSN Assets
- Frequency Matrix & Mission Set
- 2004 – 2009 Downtime Planning



# DSN Overview


## Composite Laboratory

8 March 2004

California Institute of Technology

David Baltimore, President

**JET PROPULSION LABORATORY**

Charles Elachi, Director
Gene Tattini, Deputy Director
Thomas R. Gavin, Associate Director, Flight Projects and Mission Success
Fred McNutt, Associate Director / Chief Financial Officer
Tom Prince, Chief Scientist
Erik Antonsson, Chief Technologist

General Counsel
(Reports to Caltech President)

Harry Yohalem
Vicci Stratman, Deputy

Office of Legislative and International Affairs
(107)

Rich O'Toole, Manager

Office of Communications and Education
(180)
Blaine Baggett, Manager
Stephen Kulczycki, Deputy

Jupiter Icy Moons Orbiter Project
(140)

John Casani, Manager

Exploration Systems and Technology Office
(190)

Mike Sander, Manager

Mars Exploration Program Office
(150)

Firouz Naderi, Manager

Office of Safety and Mission Success
(500)

Matt Landano, Director

Business Operations and Human Resources Directorate
(200)

Fred McNutt, Director
Steve Proia, Deputy

Engineering and Science Directorate
(300)

John Beckman, Director

Planetary Flight Projects Directorate
(400)

Chris Jones, Director

Solar System Exploration Programs Directorate
(600)

Firouz Naderi, Director
Fuk Li, Deputy

Astronomy and Physics Directorate
(700)

Larry Simmons, Director
Jakob van Zyl, Deputy

Earth Science and Technology Directorate
(800)

Diane Evans, Director
Charlie Yamarone, Deputy

Interplanetary Network Directorate
(900)

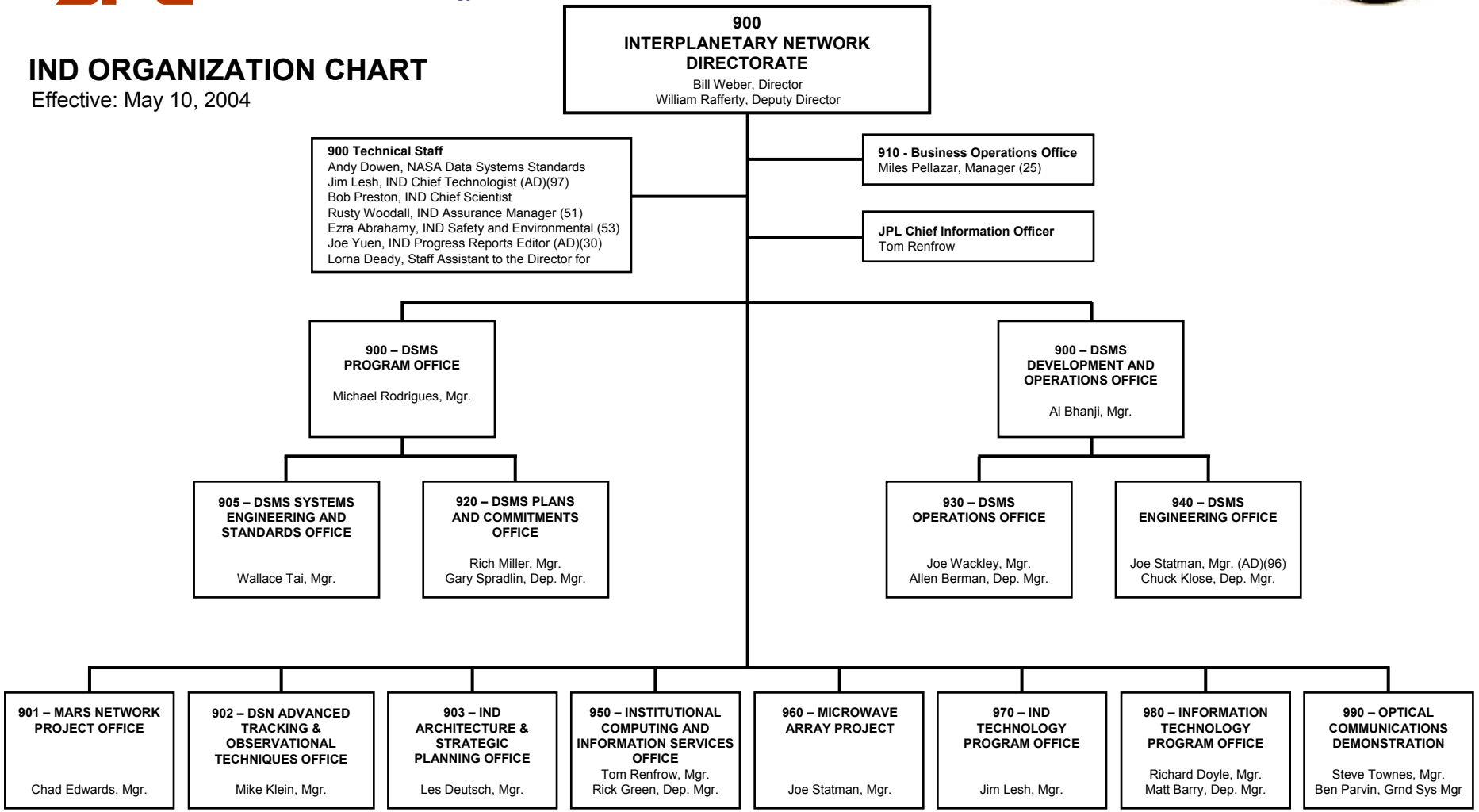
Bill Weber, Director
William Rafferty, Deputy

Jet Propulsion Laboratory
California Institute of Technology

# DSN Overview

## IND ORGANIZATION CHART

Effective: May 10, 2004




04-279A, 5-10-04

Legend:
IND = Interplanetary Network Directorate
DSMS = Deep Space Mission System
SCDS = Space Communications and Data Systems
AD = Additional Duty

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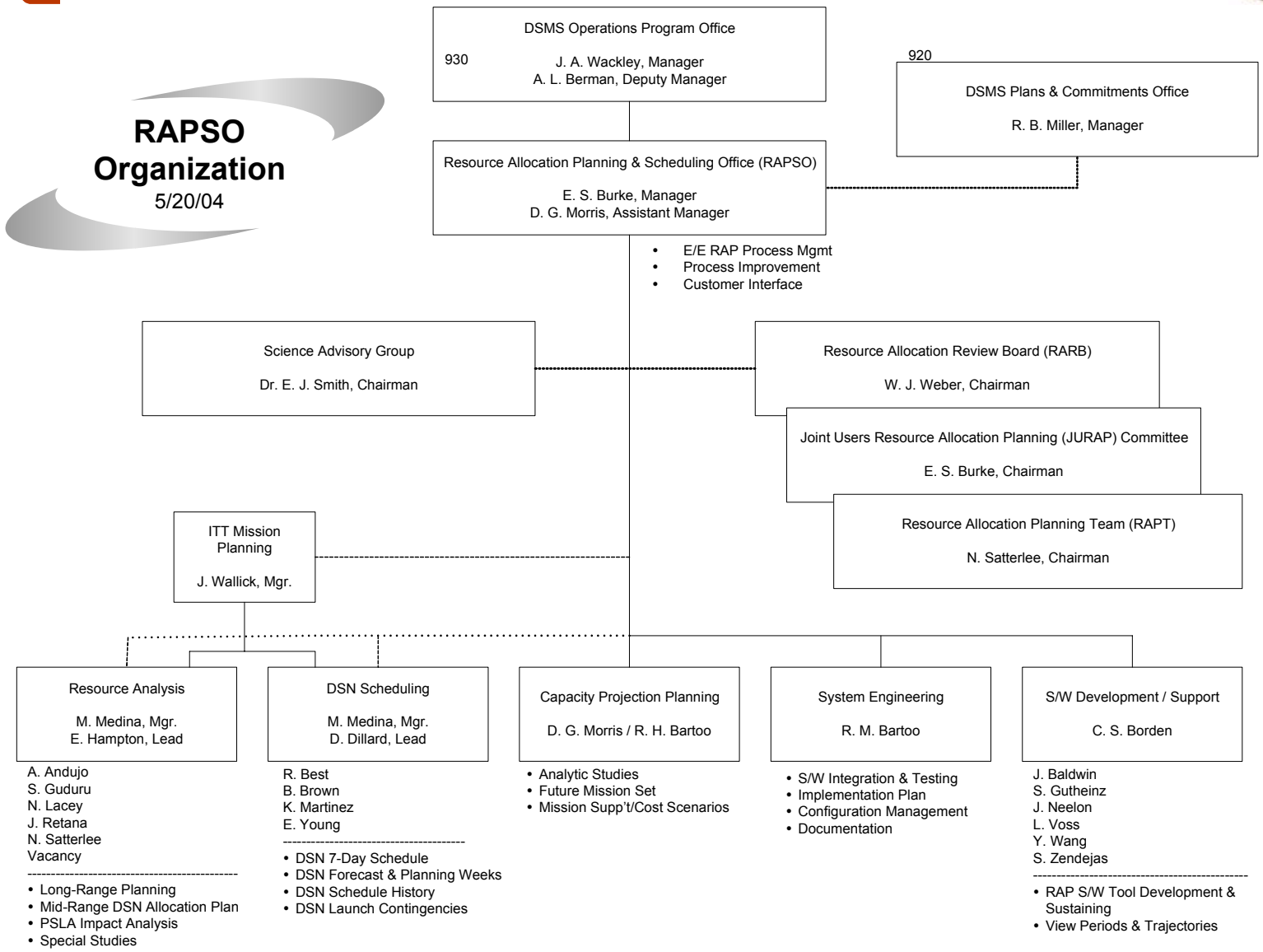
# DSN Overview

## RAPSO Organization
5/20/04



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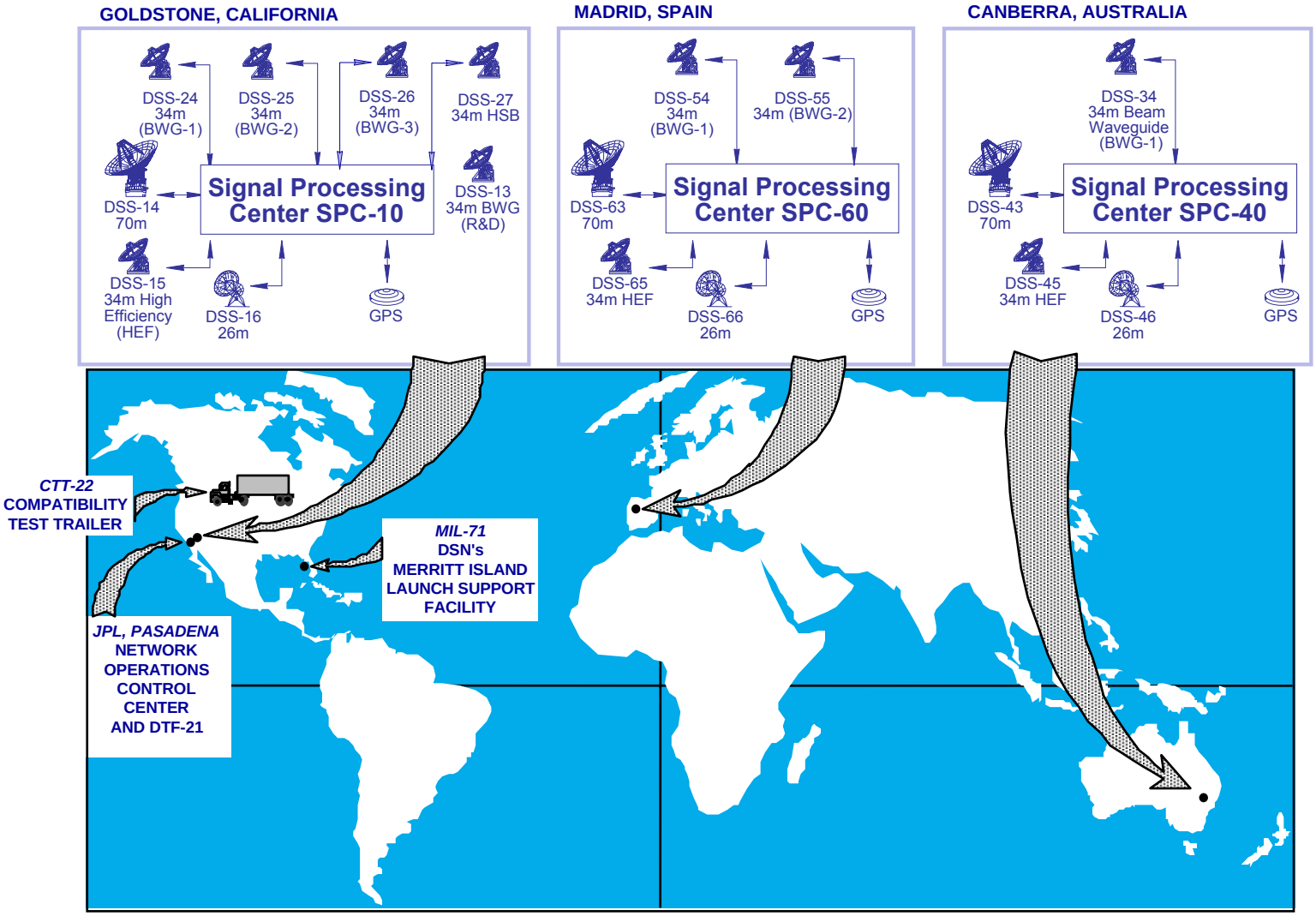
# DSN Overview

## Deep Space Network Resources






# DSN Resource Implementation Planning Matrix by Complex

| Complex | Station | Subnet | Delivery Date | S-Band Down | S-Band Up | X-Band Down | X-Band Up | 20kW X-Band | Ka-Band Down | Ka-Band Up | NSP |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | DSS-14 | 70M | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | N/A | N/A | ✔ |
| 10 | DSS-15 | 34HEF | ✔ | ✔ | N/A | ✔ | ✔ | ✔ | TBD | N/A | ✔ |
| 10 | DSS-16 | 26M | ✔ | ✔ | ✔ | N/A | N/A | N/A | N/A | N/A | N/A |
| 10 | DSS-24 | 34B1 | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | 10/23/06 | N/A | ✔ |
| 10 | DSS-25 | 34B2 | ✔ | N/A | N/A | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ |
| 10 | DSS-26 | 34B2 | ✔ | N/A | N/A | ✔ | ✔ | ✔ | ✔ | N/A | ✔ |
| 10 | DSS-27 | 34HSB | ✔ | ✔ | ✔ | N/A | N/A | N/A | N/A | N/A | 01/31/05 |
| 40 | DSS-34 | 34B1 | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | 04/11/05 | N/A | ✔ |
| 40 | DSS-43 | 70M | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | N/A | N/A | ✔ |
| 40 | DSS-45 | 34HEF | ✔ | ✔ | N/A | ✔ | ✔ | ✔ | TBD | N/A | ✔ |
| 40 | DSS-46 | 26M | ✔ | ✔ | ✔ | N/A | N/A | N/A | N/A | N/A | N/A |
| 60 | DSS-54 | 34B1 | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | 08/01/07 | N/A | ✔ |
| 60 | DSS-55 | 34B2 | ✔ | N/A | N/A | ✔ | ✔ | ✔ | ✔ | N/A | ✔ |
| 60 | DSS-63 | 70M | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ | N/A | N/A | ✔ |
| 60 | DSS-65 | 34HEF | ✔ | ✔ | N/A | ✔ | ✔ | ✔ | TBD | N/A | ✔ |
| 60 | DSS-66 | 26M | ✔ | ✔ | ✔ | N/A | N/A | N/A | N/A | N/A | N/A |

N/A = Capability Not Planned  xx/xx/xx = Capability Date Recently Changed  As of: 04/21/04

✔ ✔ ✔ = Capability Recently Exists  ✔ = Capability Exists



# DSN Frequency Matrix


| SIZE (meters) | TYPE | LOCATION | I.D. (Station) | S-BAND UP | S-BAND DOWN | X-BAND UP | X-BAND DOWN | K-BAND UP | K-BAND DOWN | RCVR. TYPE |
|---|---|---|---|---|---|---|---|---|---|---|
| 26 | E. O. [1] | Goldstone | DSS-16 | 2025-2120[9] | 2200-2300 | - | 8400-8500[14] | - | - | MFR |
| 26 | E. O. [1] | Canberra | DSS-46 | 2025-2120[9] | 2200-2300 | - | 8400-8500[14] | - | - | MFR |
| 26 | E. O. [1] | Madrid | DSS-66 | 2025-2120[9] | 2200-2300 | - | - | - | - | MFR |
| 34 | BWG1 [1, 3] | Goldstone | DSS-24 | 2025-2120[11] | 2200-2300 | 7145-7190[9] 7190-7235[9,6] | 8400-8500 | - | 10/23/06[5,7] | DTT |
| 34 | BWG1 [1, 3] | Canberra | DSS-34 | 2025-2120[11] | 2200-2300 | 7145-7190[9] 7190-7235[9,6] | 8400-8500 | - | 04/11/05[5,7] | DTT |
| 34 | BWG1 [1, 3] | Madrid | DSS-54 | 2025-2120[11] | 2200-2300 | 7145-7190[9] 7190-7235[9,6] | 8400-8500 | - | 08/01/07[5,7] | DTT |
| 34 | BWG2 [3] | Goldstone | DSS-25 | - | - | 7145-7190[9] 7190-7235[9,6] | 8400-8500 | 34200-34700[4] | 31800-32300 | DTT |
| 34 | BWG2 [3] | Goldstone | DSS-26 | - | - | 7145-7190[9] 7190-7235[9,6] | 8400-8500 | - | 31800-32300 | DTT |
| 34 | BWG2 [3] | Madrid | DSS-55 | - | - | 7145-7190[9] 7190-7235[9,6] | 8400-8500 | - | 31800-32300 | DTT |
| 34 | HEF [3] | Goldstone | DSS-15 | - | 2200-2300 | 7145-7190[9] | 8400-8500 | - | - | DTT |
| 34 | HEF [3] | Canberra | DSS-45 | - | 2200-2300 | 7145-7190[9] | 8400-8500 | - | - | DTT |
| 34 | HEF [3] | Madrid | DSS-65 | - | 2200-2300 | 7145-7190[9] | 8400-8500 | - | - | DTT |
| 34 | HSB [1] | Goldstone | DSS-27 | 2025-2120[10] | 2200-2300 | - | - | - | - | DTT/MFR |
| 70 | D. S. [3] | Goldstone | DSS-14 | 2110-2120[11,12] 2090-2094[13] | 2270-2300 | 7145-7190[9] | 8400-8500 | - | - | DTT |
| 70 | D. S. [3] | Canberra | DSS-43 | 2110-2120[11,12] 2090-2094[13] | 2270-2300 | 7145-7190[9] | 8400-8500 | - | - | DTT |
| 70 | D. S. [3] | Madrid | DSS-63 | 2110-2120[11,12] 2090-2094[13] | 2270-2300 | 7145-7190[9] | 8400-8500 | - | - | DTT |

Credit: E. Luers

**NOTES:**

1. These stations used for Earth Orbiting (Category A) missions.
2. Not Committed
3. These stations used for deep space (Category B) missions.
4. Transmit power range: 50 to 800 W
5. Planned Operational Date.
6. Near-Earth Spectrum
7. 31800-32300 MHz
8. Not used
9. Transmit power range: 200 W to 20 KW
10. Transmit power range: 50 W to 200 W
11. Transmit power range: 500 W to 20 KW
12. Transmit power range: 5 KW to 400 KW (VGR only)
13. Transmit power range: 5 KW to 150 KW (WMAP only)
14. Acquisition Aid

# DSN User / Mission Planning Set
# 2004 - 2014

As of:

| ONGOING/PLANNED PROJECTS | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ka-Band | | L-Band | | S-Band | | X-Band | | | Launch or | |
| Project | Down | Up | Down | Up | Down | Up | Down | Up | Acronym | Start | EOPM |
| DSN Antenna Calibration | | | | | | | | | DSN | -- | -- |
| DSS Maintenance | | | | | | | | | DSS | -- | -- |
| European VLBI Network | X | | X | | X | | X | | EVN | -- | -- |
| Ground Based Radio Astronomy | X | | X | | X | | X | | GBRA | -- | -- |
| Reference Frame Calibration | X | | X | | X | | X | | DSN | -- | -- |
| Space Geodesy | | | | | X | | X | | SGP | -- | -- |
| Voyager 2 | | | | | | X | X | | VGR2 | 08/20/77 | 10/15/89 |
| Voyager 1 | | | | | | X | X | | VGR1 | 09/05/77 | 12/31/80 |
| Goldstone Solar System Radar | | | | | X | X | X | X | GSSR | 04/01/85 | -- |
| Ulysses | | | | | | X | X | | ULYS | 10/06/90 | 09/11/95 |
| Geotail | | | | | X | | | | GTL | 07/24/92 | 07/24/95 |
| Wind | | | | | X | X | | | WIND | 11/01/94 | 11/01/97 |
| SOHO | | | | | X | X | | | SOHO | 12/02/95 | 05/02/98 |
| Polar | | | | | X | X | | | POLR | 02/22/96 | 08/23/97 |
| Gravity Probe B (non Spacecraft support) | | | | | X | | X | | GPB | 06/01/96 | 05/30/05 |
| Mars Global Surveyor | X | | | | | | X | X | MGS | 11/07/96 | 02/01/01 |
| Advance Composition Explorer | | | | | X | X | | | ACE | 08/25/97 | 02/01/01 |
| Cassini | X | X | | | | | X | X | CAS | 10/15/97 | 06/30/08 |
| Stardust | | | | | | | X | X | SDU | 02/07/99 | 01/14/06 |
| Chandra X-ray Observatory | | | | | X | X | | | CHDR | 07/23/99 | 07/24/09 |
| Imager for Magnetopause-to-Aurora Global Exploration | | | | | X | X | | | IMAG | 03/25/00 | 05/30/02 |
| Cluster 2 - S/C #2 (Samba) | | | | | X | X | | | CLU2 | 07/16/00 | 02/15/03 |
| Cluster 2 - S/C #3 (Rumba) | | | | | X | X | | | CLU3 | 07/16/00 | 02/15/03 |
| Cluster 2 - S/C #1 (Salsa) | | | | | X | X | | | CLU1 | 08/09/00 | 02/15/03 |
| Cluster 2 - S/C #4 (Tango) | | | | | X | X | | | CLU4 | 08/09/00 | 02/15/03 |
| Mars Odyssey 2001 | | | | | | | X | X | M01O | 04/07/01 | 08/24/04 |
| Wilkinson Microwave Anisotropy Probe | | | | | X | X | | | WMAP | 06/30/01 | 10/01/03 |




## ONGOING/PLANNED PROJECTS

| Project | Ka-Band Down | Ka-Band Up | L-Band Down | L-Band Up | S-Band Down | S-Band Up | X-Band Down | X-Band Up | Acronym | Launch or Start | EOPM |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Genesis | | | | | X | X | | | GNS | 08/08/01 | 09/08/04 |
| Advanced Tracking and Observational Techniques (ATOT) | X | | X | | X | | X | | MEGA | 02/01/02 | 12/31/08 |
| International Gamma Ray Astrophysics Lab | | | | | X | X | | | INTG | 10/17/02 | 12/18/04 |
| Hayabusa (MUSES - C) | | | | | | | X | X | MUSC | 05/09/03 | 06/05/07 |
| Mars Express Orbiter | | | | | X | X | X | X | MEX | 06/02/03 | 02/11/06 |
| Spirit (Mars Exploration Rover - A) | | | | | | | X | X | MER2 | 06/10/03 | 04/06/04 |
| Opportunity (Mars Exploration Rover - B) | | | | | | | X | X | MER1 | 07/07/03 | 04/27/04 |
| Spitzer Space Telescope (SIRTF) | | | | | | | X | X | STF | 08/25/03 | 02/25/06 |
| Rosetta | | | | | X | X | X | X | ROSE | 02/26/04 | 12/31/15 |
| Messenger | | | | | | | X | X | MSGR | 07/30/04 | TBD |
| Deep Impact | | | | | | | X | X | DIF | 12/30/04 | 08/05/05 |
| Lunar - A | | | | | X | X | | | LUNA | 08/01/05 | TBD |
| Mars Reconnaissance Orbiter | X | | | | | | X | X | MRO | 08/10/05 | 12/31/10 |
| Space Technology 5 | | | | | | | X | X | ST5 | 03/01/06 | 02/27/05 |
| New Horizons | | | | | | | X | X | NHPC | 01/10/06 | 04/17/16 |
| Stereo Ahead | | | | | | | X | X | STA | 02/11/06 | 05/16/08 |
| Stereo Behind | | | | | | | X | X | STB | 02/11/06 | 05/16/08 |
| Dawn | | | | | | | X | X | DAWN | 06/17/06 | 07/26/15 |




| ADVANCED PLANNING PROJECTS | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ka-Band | | L-Band | | S-Band | | X-Band | | | Launch or | |
| Project | Down | Up | Down | Up | Down | Up | Down | Up | Acronym | Start | EOPM |
| Venus Express * | | | | | | | | | VEX | 10/26/05 | 08/19/07 |
| SELENE * | | | | | X | X | | | SELE | 08/01/06 | 08/21/06 |
| Phoenix Scout | | | | | | | X | X | PHX | 08/09/07 | 11/04/08 |
| Kepler | X | | | | | | X | X | KEPL | 10/01/07 | 09/26/11 |
| Mars Telecommunications Orbiter 2009 | | | | | | | | | M09T | 09/07/09 | 09/07/16 |
| Mars Science Laboratory 2009 | | | | | | | | | M09L | 10/25/09 | 03/04/12 |
| Space Interferometry Mission | | | | | | | | | SIM | 02/14/10 | 06/30/20 |
| James Webb Space Telescope | | | | | | | | | JWST | 08/01/11 | 07/31/16 |
| Mars Placeholder 2011 | | | | | | | | | M11S | 10/30/11 | 09/10/14 |
| Mars Placeholder 2013 | | | | | | | | | M13O | 11/28/13 | 08/21/16 |

*** DSN support may not be required for these missions**

# DSN User / Future Mission Planning Set

## 2006 - 2030

| FUTURE NASA PROJECTS | | | | |
|---|---|---|---|---|
| **Project** | **Code S Theme** | **Launch or Start** | **EOPM** | **EOEM** |
| Laser Interferometer Space Antenna (LISA) | SEU | 06/01/11 | 07/01/16 | 07/01/21 |
| Inflation Probe | SEU | 09/01/18 | 09/01/22 | -- |
| Constellation-X (A Set) | SEU | 12/01/13 | 01/31/18 | 01/31/23 |
| Constellation-X (B Set) | SEU | 12/01/14 | 01/31/18 | 01/31/23 |
| Dark Energy Probe | SEU | 09/05/15 | 09/02/18 | 09/02/20 |
| Black Hole Finder Probe | SEU | 06/01/21 | 07/01/24 | -- |
| Big Bang Observer | SEU | 07/01/26 | 07/01/31 | 07/01/36 |
| Black Hole Imager | SEU | 01/31/26 | 01/31/31 | 01/01/36 |
| Discovery Mission 11 | ASO | 09/01/08 | 12/01/13 | 12/01/15 |
| Terrestrial Planet Finder (TPF) | ASO | 04/01/14 | 03/31/19 | 03/31/24 |
| Single Aperture Far-Infrared Observatory | ASO | 06/03/17 | 06/02/22 | 06/02/27 |
| Discovery Mission 13 | ASO | 04/01/12 | 03/31/17 | -- |
| Space Ultraviolet/Optical Telescope | ASO | 01/01/21 | 12/31/25 | 01/31/31 |
| Life Finder | ASO | 04/01/24 | 04/01/29 | 04/01/34 |
| Planet Imager | ASO | 04/01/29 | 04/01/34 | 04/01/39 |
| Discovery Mission 15 | ASO | 01/01/16 | 12/31/20 | -- |
| South Pole Aitken Basin Sample Return * | ESS | 03/08/11 | 08/08/11 | -- |
| Mars Scouts 2011 | ESS | 10/30/11 | 09/10/14 | -- |
| Discovery Mission 12 | ESS | 04/01/10 | 03/31/15 | -- |
| Venus In-situ Explorer (VISE) * | ESS | 04/01/15 | 03/31/18 | -- |
| Comet Surface Sample Return (CSSR) * | ESS | 07/15/18 | 09/20/23 | -- |
| Jupiter Icy Moons Tour/Orbiter | ESS | 04/01/11 | 03/31/21 | -- |
| Discovery Mission 14 | ESS | 09/01/14 | 08/31/19 | -- |
| Mars Scouts 2014 | ESS | 12/27/13 | 08/21/16 | -- |
| Mars Long Lived Lander Network | ESS | 02/20/16 | 01/01/18 | 01/01/19 |
| Jupiter Polar Orbiter with Probes | ESS | 01/01/16 | 10/25/30 | -- |
| Discovery Mission 16 | ESS | 09/01/18 | 10/01/23 | -- |
| Mars Scouts 2018 | ESS | 05/07/18 | 06/01/22 | -- |
| Mars Upper Atmosphere Orbiter (Mars Aeronomy) | ESS | 05/17/18 | 06/01/21 | -- |

# DSN User / Future Mission Planning Set (Con't)

## 2006 - 2030

| FUTURE NASA PROJECTS | | | | |
|---|---|---|---|---|
| Project | Code S Theme | Launch or Start | EOPM | EOEM |
| Mars Sample Return | ESS | 06/06/20 | 07/01/24 | -- |
| Europa Lander | ESS | 04/01/20 | 04/01/26 | -- |
| Titan Explorer | ESS | 02/01/19 | 02/01/29 | -- |
| Time History of Events and Macroscale Interactions during Substorms | SEC | 04/01/07 | 05/01/09 | 06/01/10 |
| Magnetospheric Multiscale (MMS) | SEC | 07/01/09 | 07/01/11 | 07/01/12 |
| Solar Probe | SEC | 05/26/10 | 07/18/17 | 07/18/21 |
| Magnetospheric Constellation (MAGCON) | SEC | 09/01/12 | 08/31/14 | 08/31/15 |
| Telemachus | SEC | 01/01/12 | 01/01/24 | 01/01/27 |
| Heliospheric Imager and Galactic Observer | SEC | 01/01/14 | 09/27/18 | -- |
| Inner Heliosphere Sentinals | SEC | 01/01/09 | 01/31/14 | -- |
| Interstellar Probe | SEC | 09/01/20 | 01/01/37 | 01/01/45 |
| Solar Polar Imager | SEC | 02/15/15 | 08/15/22 | 08/15/25 |
| IO Electrodynamics | SEC | 01/01/17 | 01/01/23 | -- |
| Stellar Imager | SEC | 01/01/19 | 01/01/24 | 01/01/29 |
| Solar Connections Observatory For Planetary Environs (SCOPE) | SEC | 01/01/16 | 01/01/21 | 01/01/26 |
| Particle Acceleration Solar Orbiter (PASO) | SEC | 01/01/14 | 01/01/22 | -- |
| Neptune Orbiter | SEC | 01/01/23 | 01/01/37 | -- |
| L1-Diamond | SEC | 04/01/18 | 03/31/21 | 03/31/24 |
| Solar Imaging Radio Array (SIRA) | SEC | 06/01/18 | 06/01/23 | -- |
| Sun-Heliosphere-Earth Constellation | SEC | 01/01/26 | 01/01/36 | 01/01/41 |
| Venus Aeronomy | SEC | 06/01/19 | 06/01/21 | -- |
| Space Technology-9 (ST-9) | NMP | 01/01/09 | 01/01/10 | -- |
| * New Frontier Missions | | | | |

# DSN 26M LEO User / Mission Planning Set

## 2004 - 2014

As of: May 21, 2004

**ONGOING/PLANNED PROJECTS**

| Project | Acronym | Support | Launch or Start | Commit End of Support | Potential End of Support |
|---|---|---|---|---|---|
| IMP-8 | IMP8 | ROUTINE-V | 10/26/73 | 12/31/08 | 12/31/08 |
| TDRS-1 | TDR1 | E | 04/04/83 | 09/30/01 | 12/31/08 |
| LANDSAT 5 | LAN5 | E | 03/01/84 | 09/30/05 | |
| EARTH RADIATION BUDGET SAT | ERBS | E | 10/05/84 | 09/30/98 | 09/30/04 |
| TDRS-3 | TDR3 | E | 09/29/88 | 09/30/01 | 12/31/08 |
| TDRS-4 | TDR4 | E | 03/13/89 | 09/30/01 | 12/31/08 |
| HUBBLE SPACE TELESCOPE | HST | E | 04/24/90 | 04/24/10 | |
| TDRS-5 | TDR5 | E | 08/02/91 | 08/02/01 | 12/31/08 |
| UARS | UARS | E | 09/12/91 | 09/30/04 | |
| TDRS-6 | TDR6 | E | 01/13/93 | 01/13/03 | 12/31/08 |
| GOES-8 | GO08 | E | 04/13/94 | 05/05/04 | |
| GOES-9 | GO09 | E | 05/22/95 | 09/30/04 | |
| TDRS-7 | TDR7 | E | 07/13/95 | 12/31/08 | 12/31/15 |
| RADARSAT-1 | RSAT | Routine-B | 11/04/95 | 09/30/03 | 09/30/08 |
| ROSSI X-RAY TIMING EXPLORER | XTE | E | 12/30/95 | 09/30/04 | 09/30/10 |
| TOMS-EP | TEP | E | 07/02/96 | 09/30/05 | |
| GOES-10 | GO10 | E | 04/25/97 | 05/22/03 | 09/30/05 |
| TRMM | TRMM | E | 11/27/97 | 09/30/05 | 09/30/06 |
| POES-15 | NO15 | E | 05/13/98 | 09/30/04 | |
| GOES-11 | GO11 | E | 05/03/00 | 05/03/05 | 09/30/07 |
| TDRS-8 | TDR8 | E | 06/30/00 | 09/30/10 | 09/30/14 |
| POES-16 | NO16 | E | 09/21/00 | 09/30/04 | |
| GOES-12 | GO12 | E | 07/24/01 | 07/24/06 | 09/30/08 |
| TDRS-9 | TDR9 | E | 03/08/02 | 03/08/13 | 03/08/17 |
| TERRA | | A | 12/18/99 | 12/18/04 | |
| POES-17 | NO17 | E | 06/24/02 | 06/24/04 | |

# DSN 26M LEO User / Mission Planning Set (Con't)

## 2004 - 2014

As of: May 21, 2004

**ONGOING/PLANNED PROJECTS**

| Project | Acronym | Support | Launch or Start | Commit End of Support | Potential End of Support |
|---|---|---|---|---|---|
| TDRS-10 | TD10 | E | 12/04/02 | 12/03/13 | 12/03/17 |
| NOAA-N | NO18 | LEOP/E | 12/02/04 | 12/12/04 | |
| GOES-N | GO13 | LEOP/E | 12/01/04 | 12/31/09 | |
| GOES-O | GO14 | LEOP/E | 04/01/07 | 03/31/12 | |
| NOAA-N' | NO19 | LEOP/E | 03/01/08 | 03/11/08 | |
| GOES-P | GO15 | LEOP/E | 04/01/12 | 04/01/17 | |

NOTES

ROUTINE: Provides normal scheduled daily operation

LEOP: Launch and Early Orbit Operations

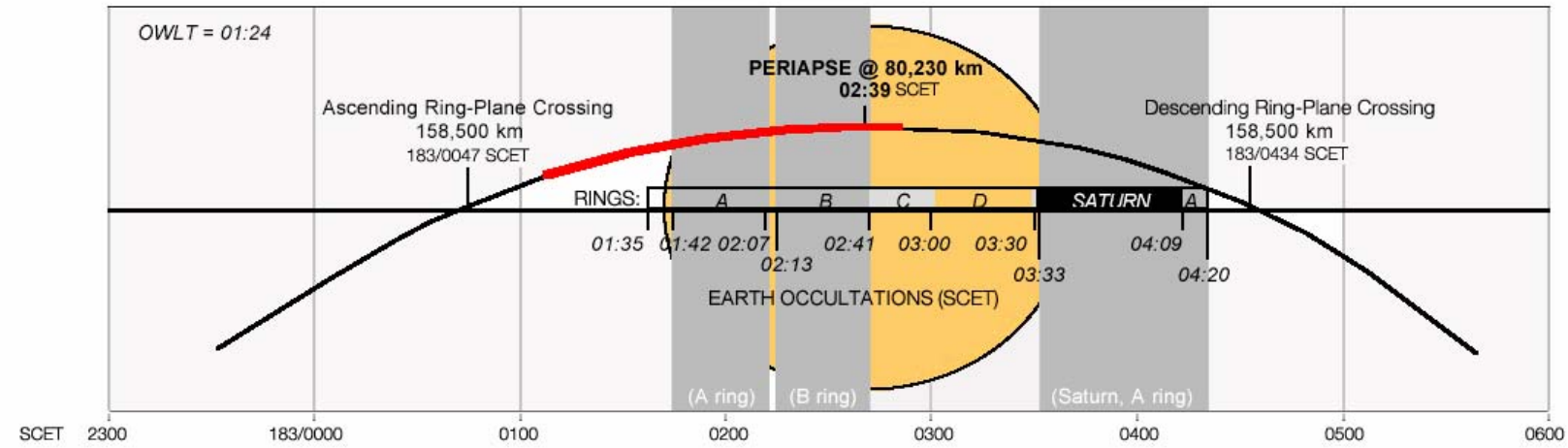
E or C: Emergency or Contingency Support

A: Used soley to calibrate X-band Acq Aid at DSS-16, DSS-46

B: Back-up support

- V: Use VHF Antenna at SPC 40

# Cassini / Huygens



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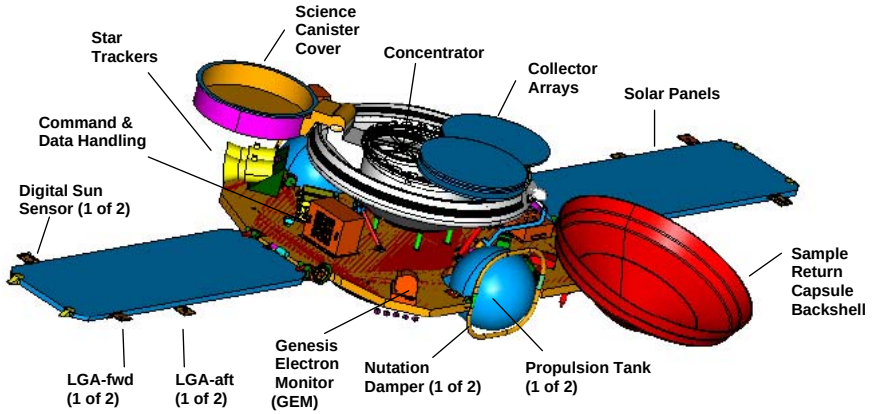
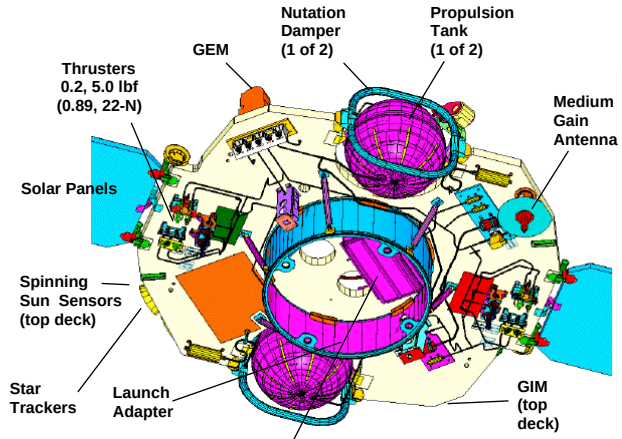
# GENESIS Sample Return

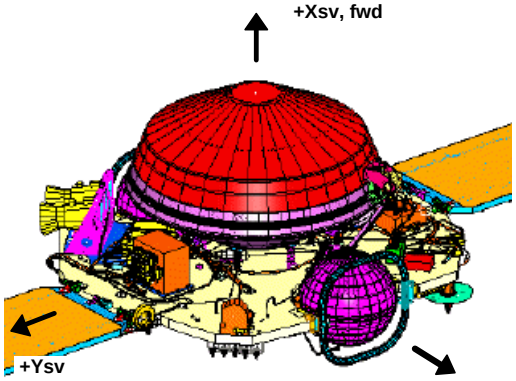
## Spacecraft Overview



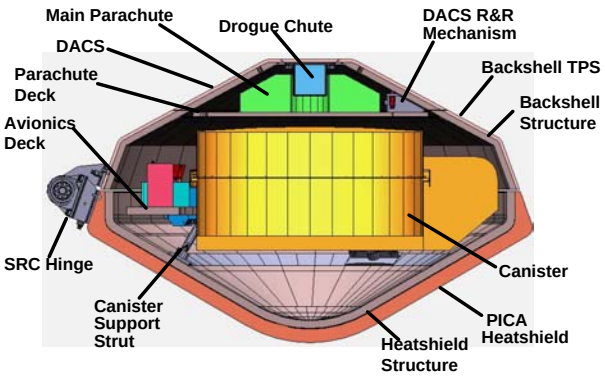

* Genesis Ion Monitor (GIM) is caddy corner GEM, on +Xsv deck (fwd)
* MGA and thrusters on -Xsv deck, towards -Xsv-axis (aft)

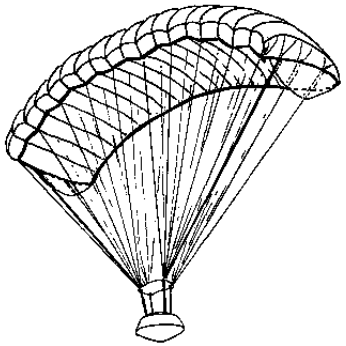



* open canister cover and SRC backshell not shown




SRC Backshell and Canister Cover closed



Input provided by Ed Hirst
GNS Mission Manager

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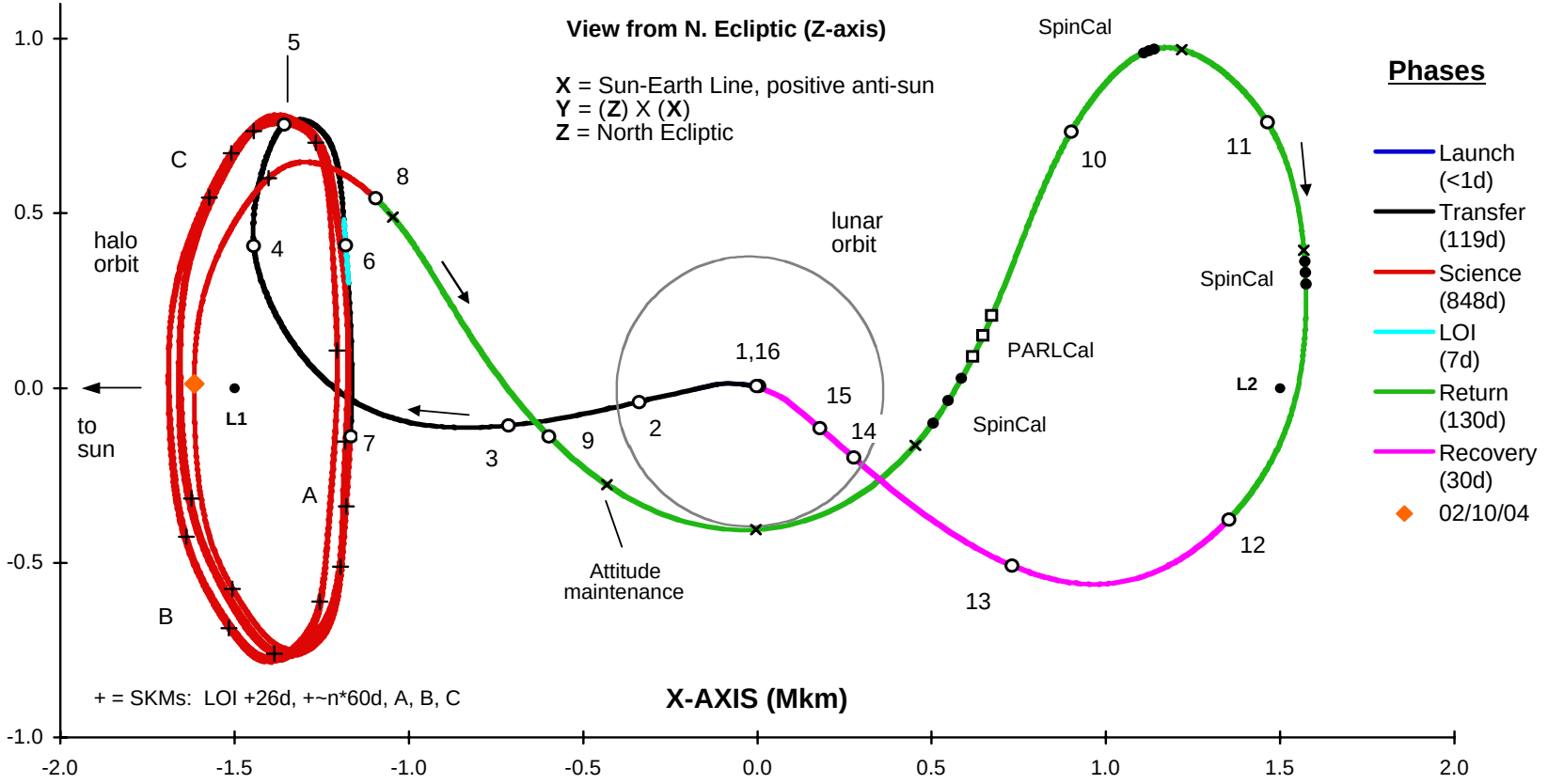
California Institute of Technology

# GENESIS Sample Return

## GENESIS TRAJECTORY OVERVIEW




**Key Events**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1. Launch | 08aug01/000 | 6. LOI (TCM-5) | 16nov01/100 | 11. TCM-8 | 30jun04/1057 | 16. Entry | 08sep04/1127 |
| 2. TCM-1 | 10aug01/002 | 7. Start Science | 05dec01/119 | 12. TCM-9 | 09aug04/1097 | Divert | 08sep04/1127 |
| ~~(3.TCM-2 15aug01/007)~~ | | 8. End Science | 01apr04/967 | 13. TCM-10 | 29aug04/1117 | | |
| ~~(4.TCM-3 18sep01/041)~~ | | 9. TCM-6 | 22apr04/988 | 14. TCM-11 | 06sep04/1125 | | |
| ~~(5.TCM-4 03oct01/065)~~ | | 10. TCM-7 | 25may04/1021 | 15. TCM-12 | 07sep04/1126 | | |

Input provided by Ed Hirst
GNS Mission Manager

# Terminal Approach

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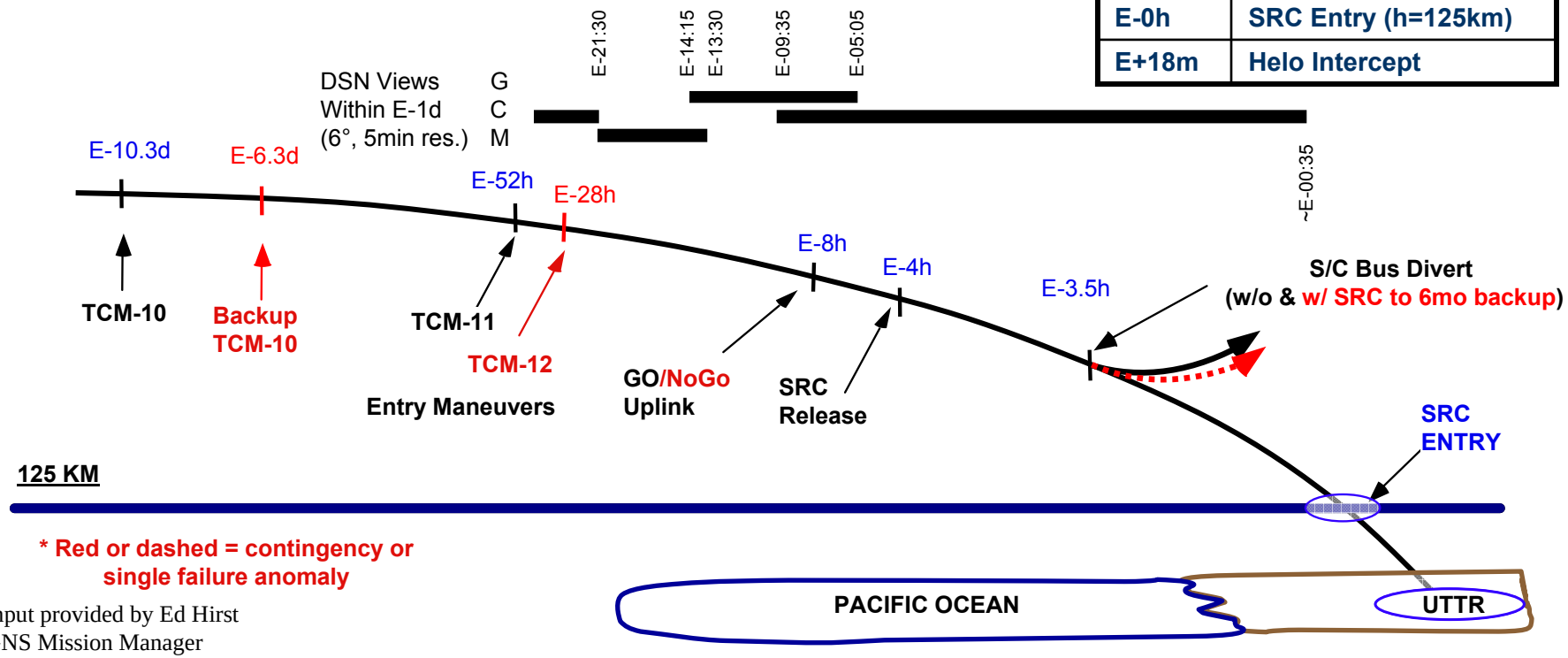
| Time | MOS Events |
|---|---|
| E-13d | OD Data Cutoff |
| E-76h | OD Data Cutoff |
| E-10.5h | OD Data Cutoff |

| Time | Project Activity |
|---|---|
| E-11d | TCM Command Conference |
| E-58h | TCM Command Conference |
| E-8.5h | PROJECT Conference |

| Time | Flight Events |
|---|---|
| E-10.3d | TCM-10 |
| E-52h | TCM-11 |
| E-5.9 | Start SRC Rel Sequence |
| E-4h | SRC Release |
| E-3.5h | Divert (w/ or w/o SRC) |
| E-2h | Helo Pilot Briefing |
| E-0h | SRC Entry (h=125km) |
| E+18m | Helo Intercept |




* Red or dashed = contingency or single failure anomaly

Input provided by Ed Hirst
GNS Mission Manager

# Entry, Descent and Mid-Air Capture

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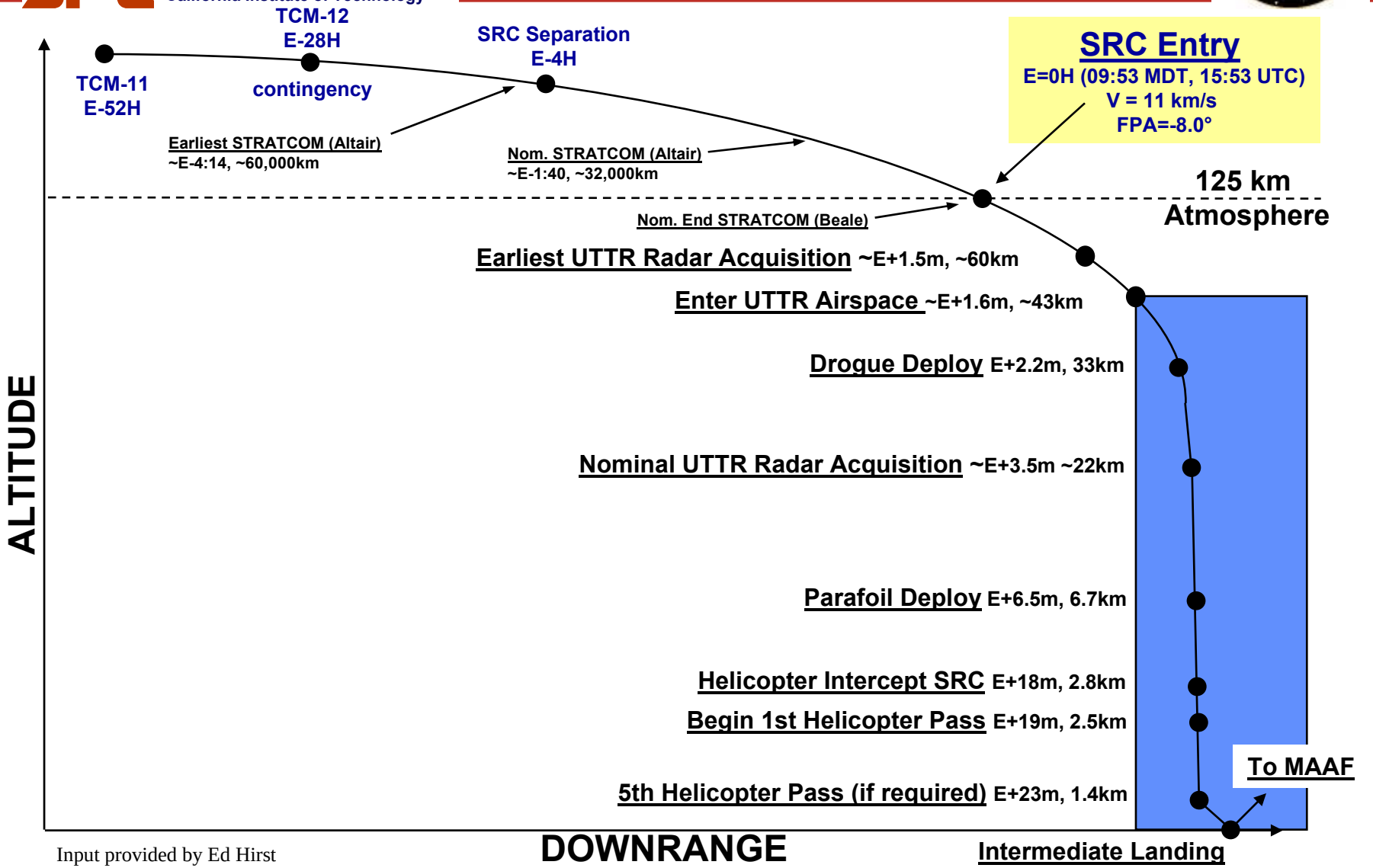


Input provided by Ed Hirst
GNS Mission Manager

# GENESIS Sample Return

## Capsule Capture

# Antenna Downtime Status And Forecast 2004

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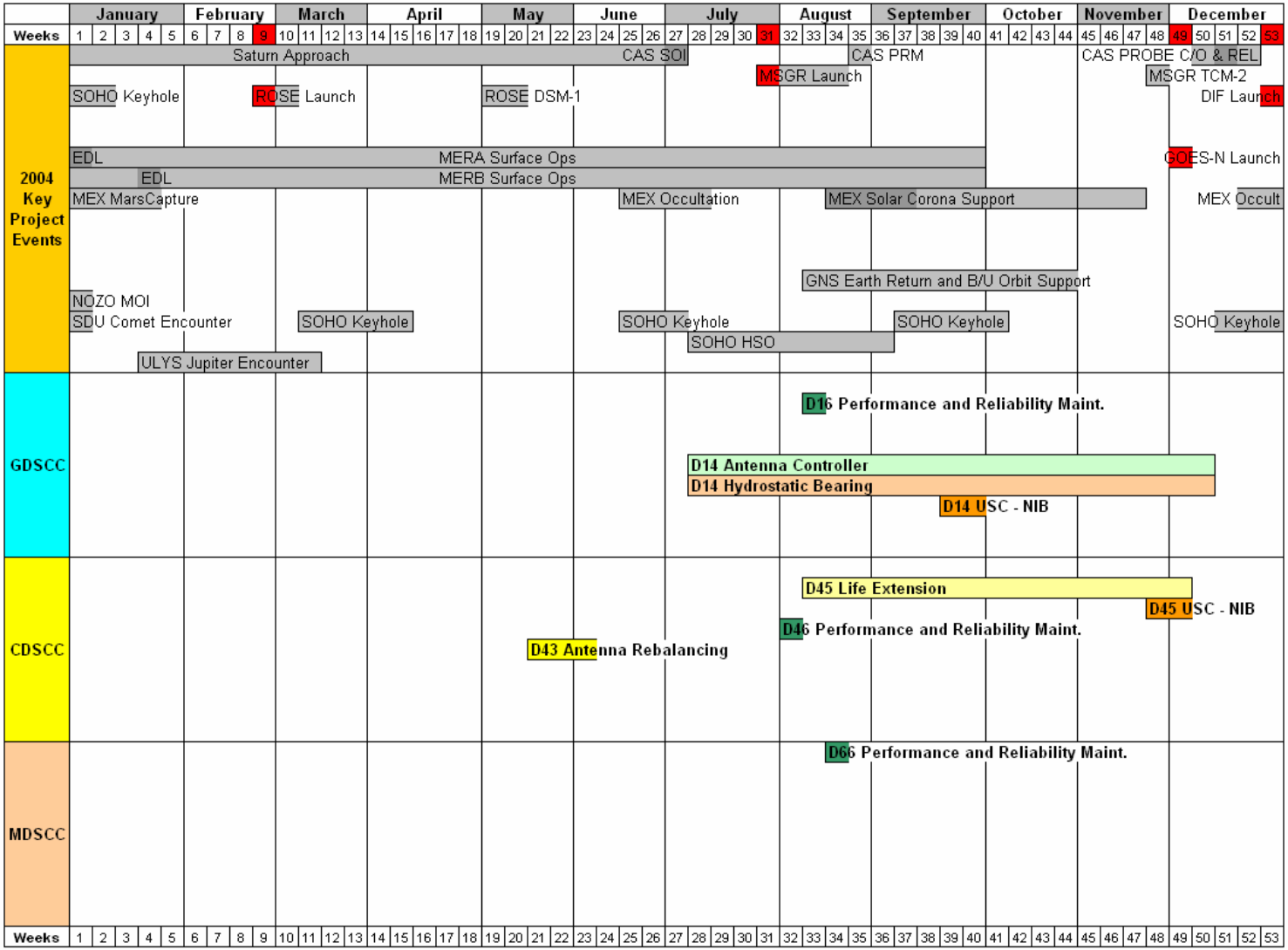
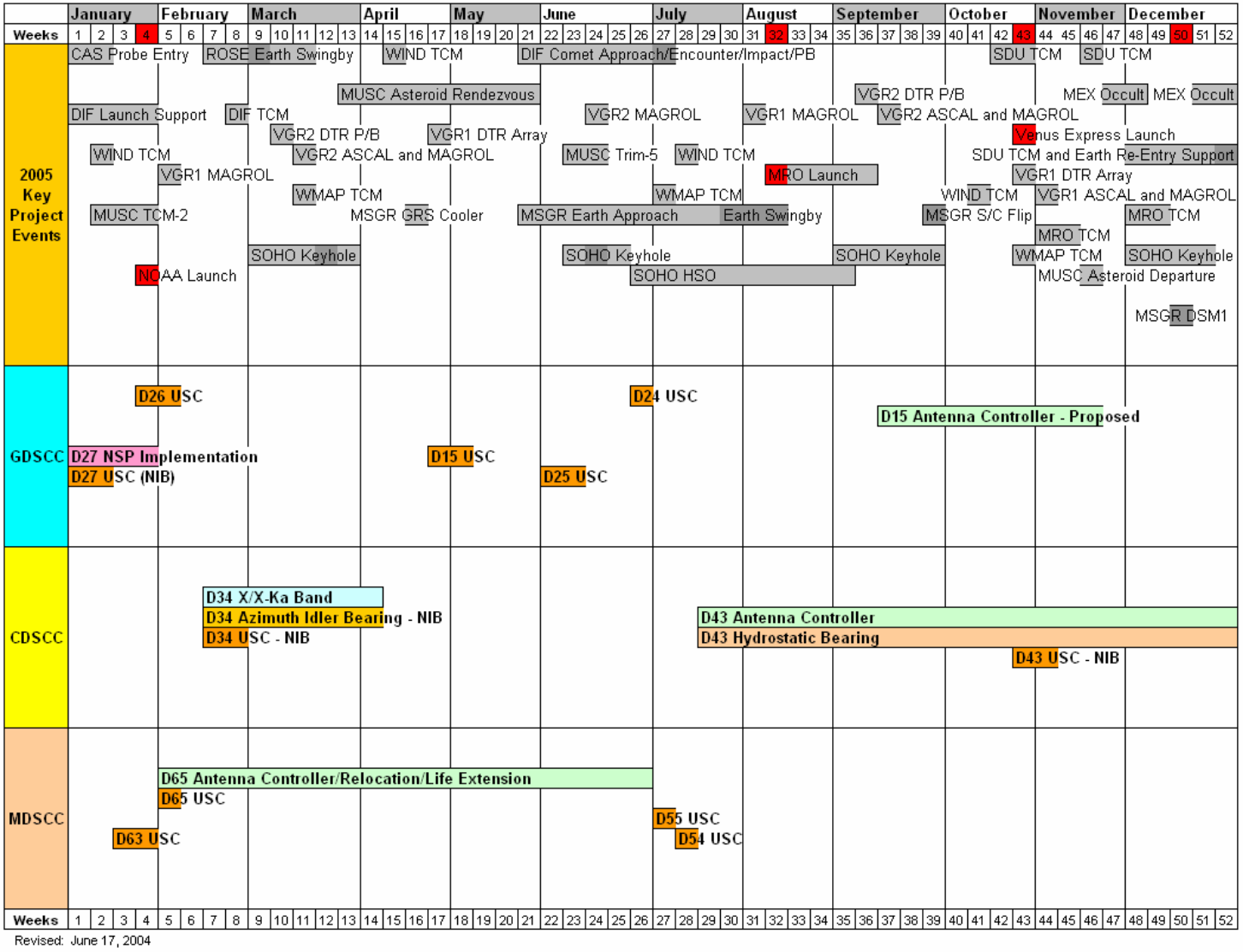



Revised: June 17, 2004

# Antenna Downtime Status And Forecast 2005

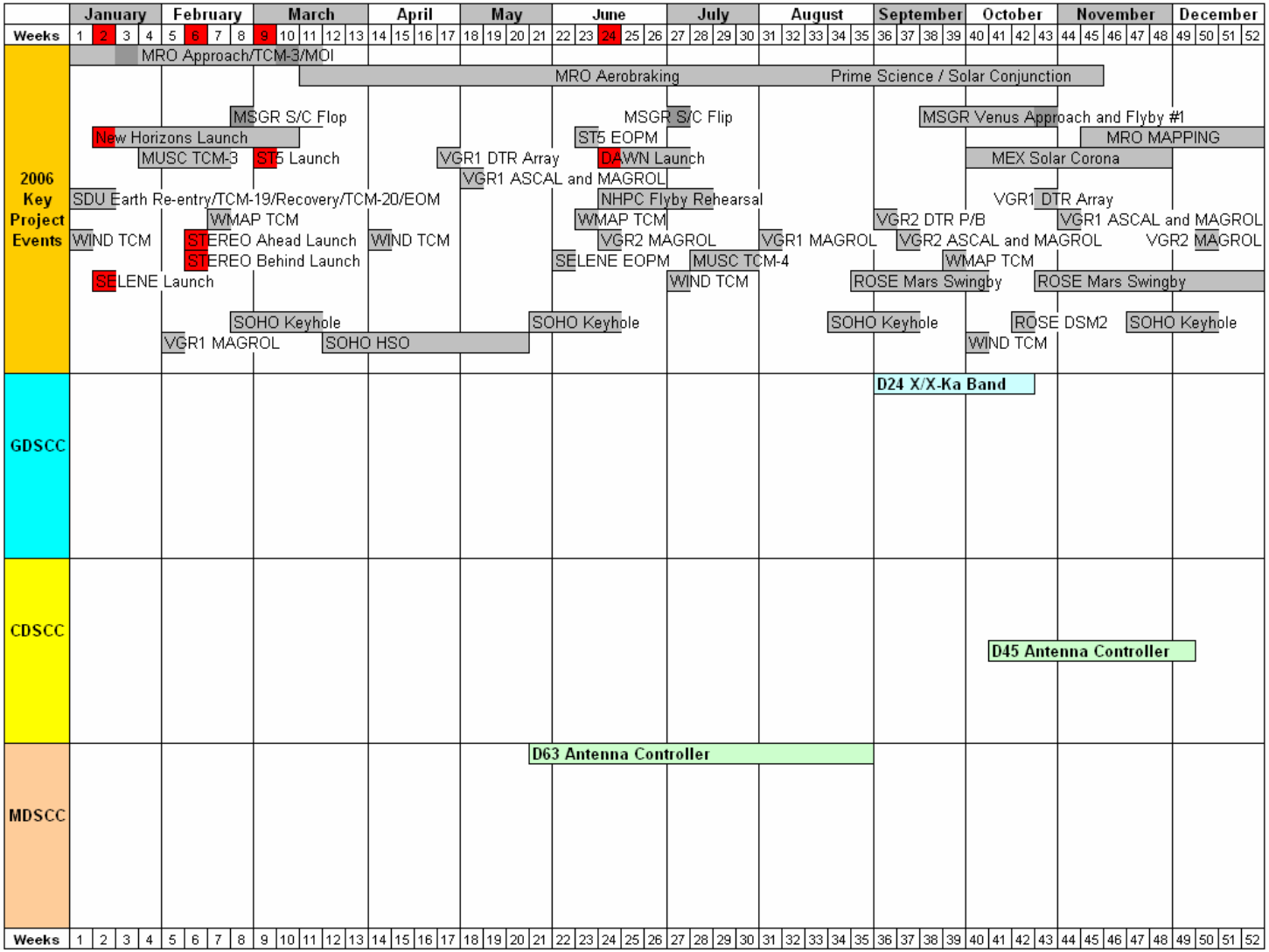
Jet Propulsion Laboratory
California Institute of Technology




Revised: June 17, 2004

# Antenna Downtime Status And Forecast 2006

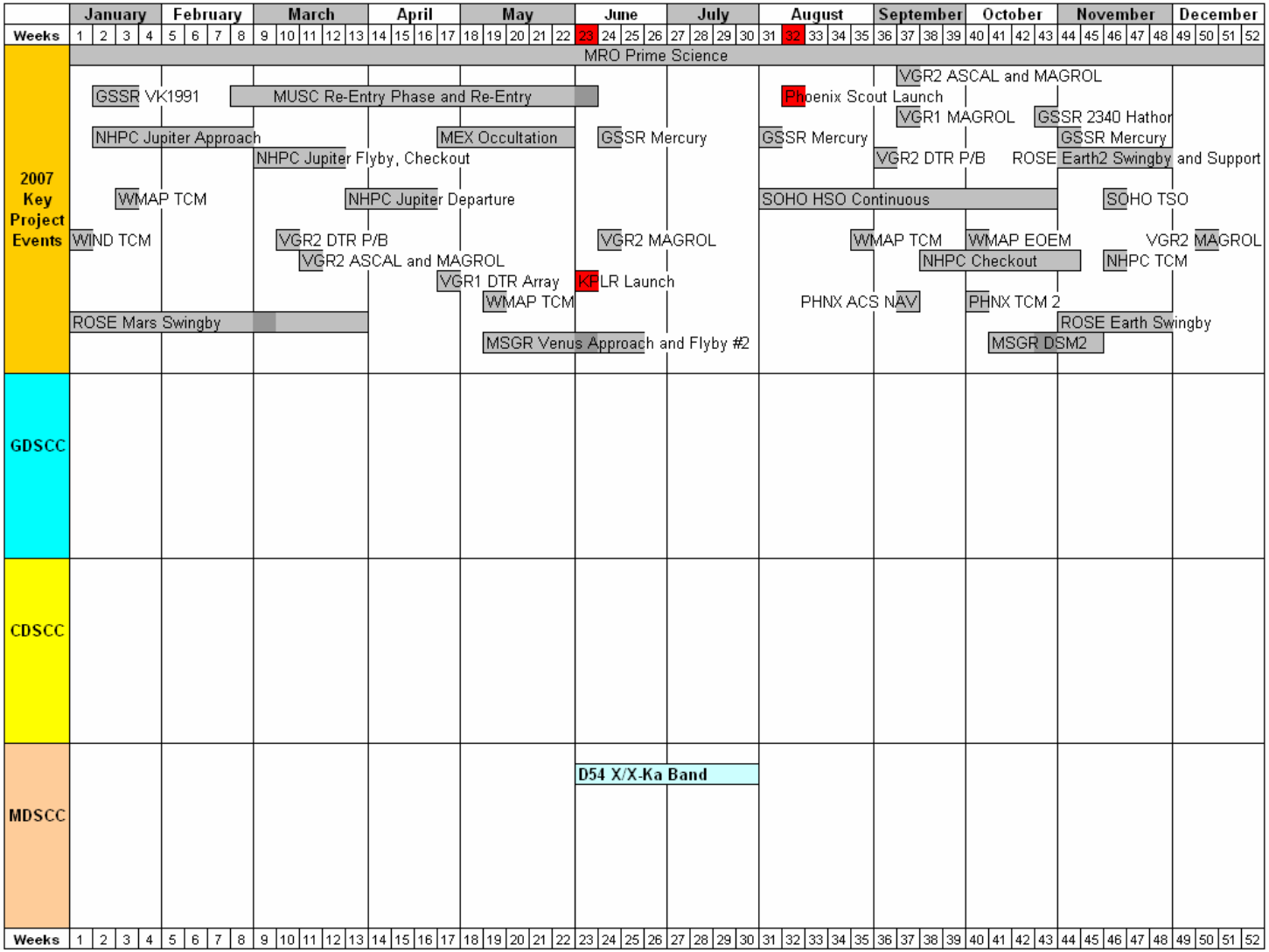
Jet Propulsion Laboratory
California Institute of Technology




Revised: June 15, 2004

# Antenna Downtime Status And Forecast 2007

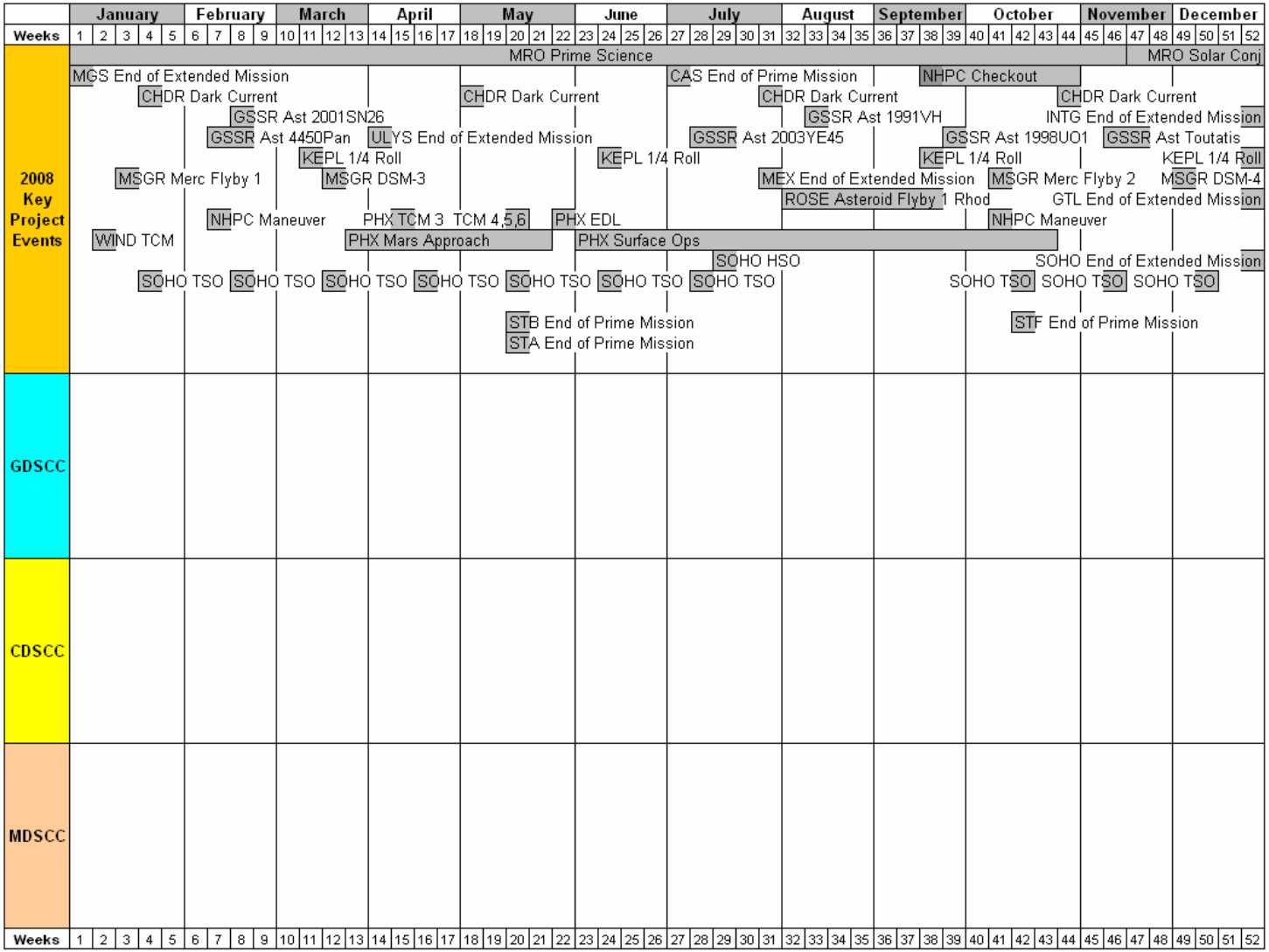
Jet Propulsion Laboratory
California Institute of Technology




Revised: June 15, 2004

# Antenna Downtime Status And Forecast 2008

Jet Propulsion Laboratory
California Institute of Technology




Revised: June 15, 2004

# Antenna Downtime Status And Forecast 2009

Jet Propulsion Laboratory
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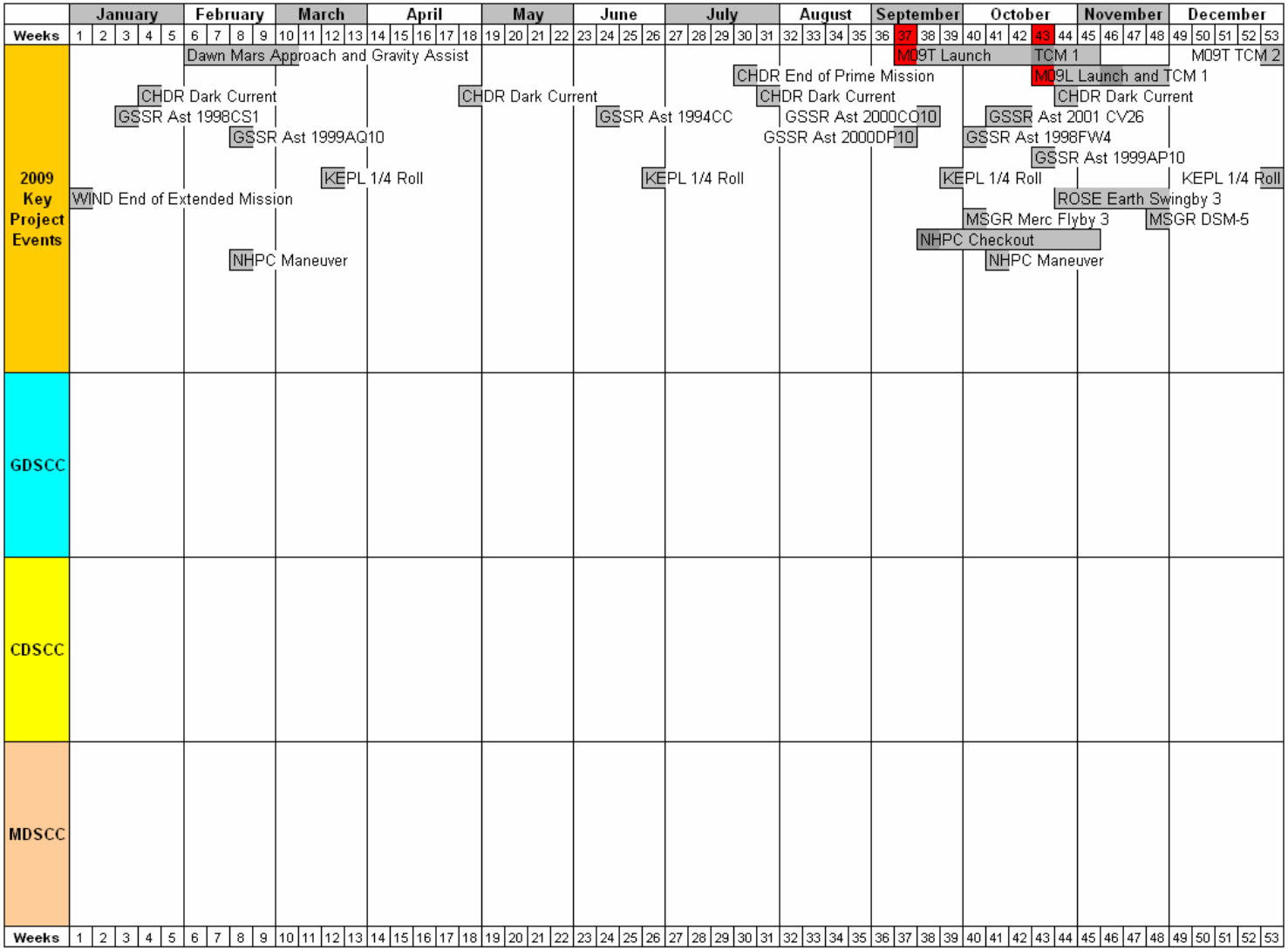


Revised: June 15, 2004



# ITT DSN Overview


Margaret Medina

## AGENDA

- **Organizational Charts –**
  - **ITT**
  - **Contract Overview**
  - **Vision and Mission**
- **Network Engineering**
  - **Function, Responsibilities**
- **Mission Support Products Engineering**
  - **Function, Responsibilities**
- **Network Operations**

ITT Industries

# ITT DSN Overview

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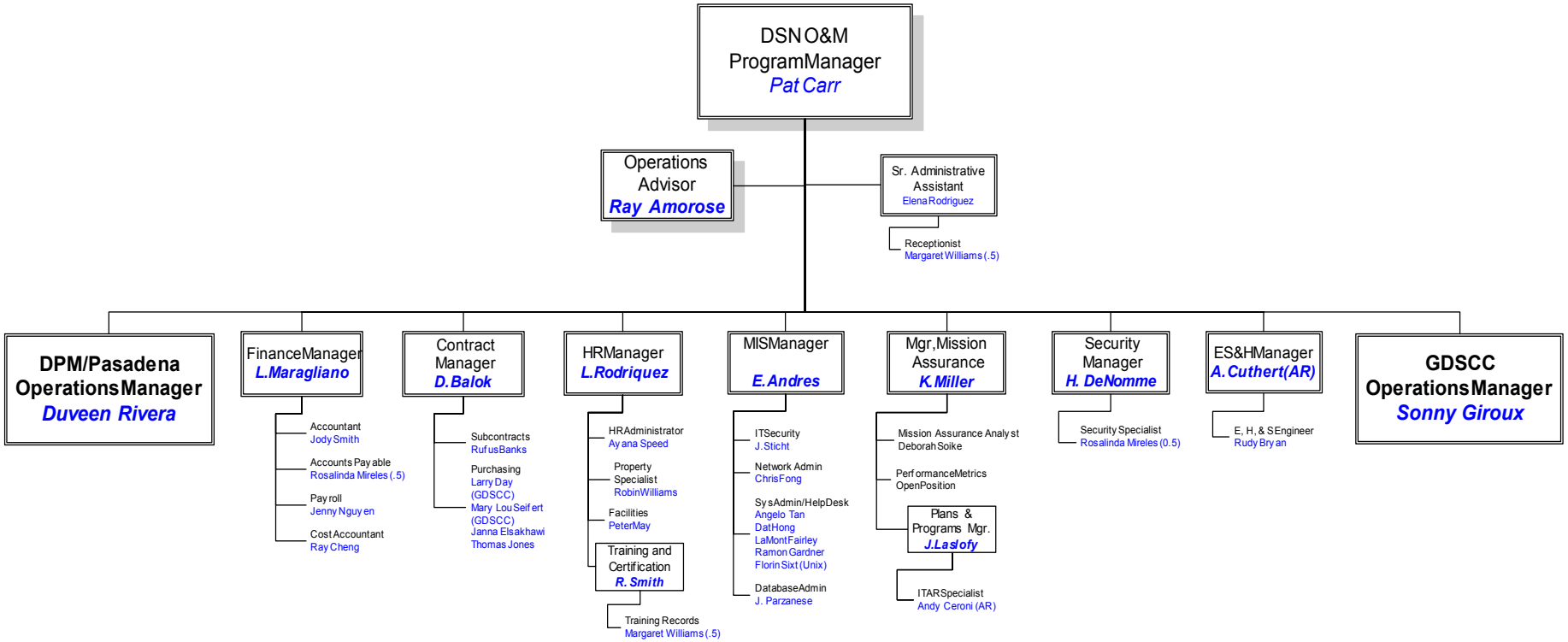
California Institute of Technology

ITT Industries

## Deep Space Network Operations & Maintenance



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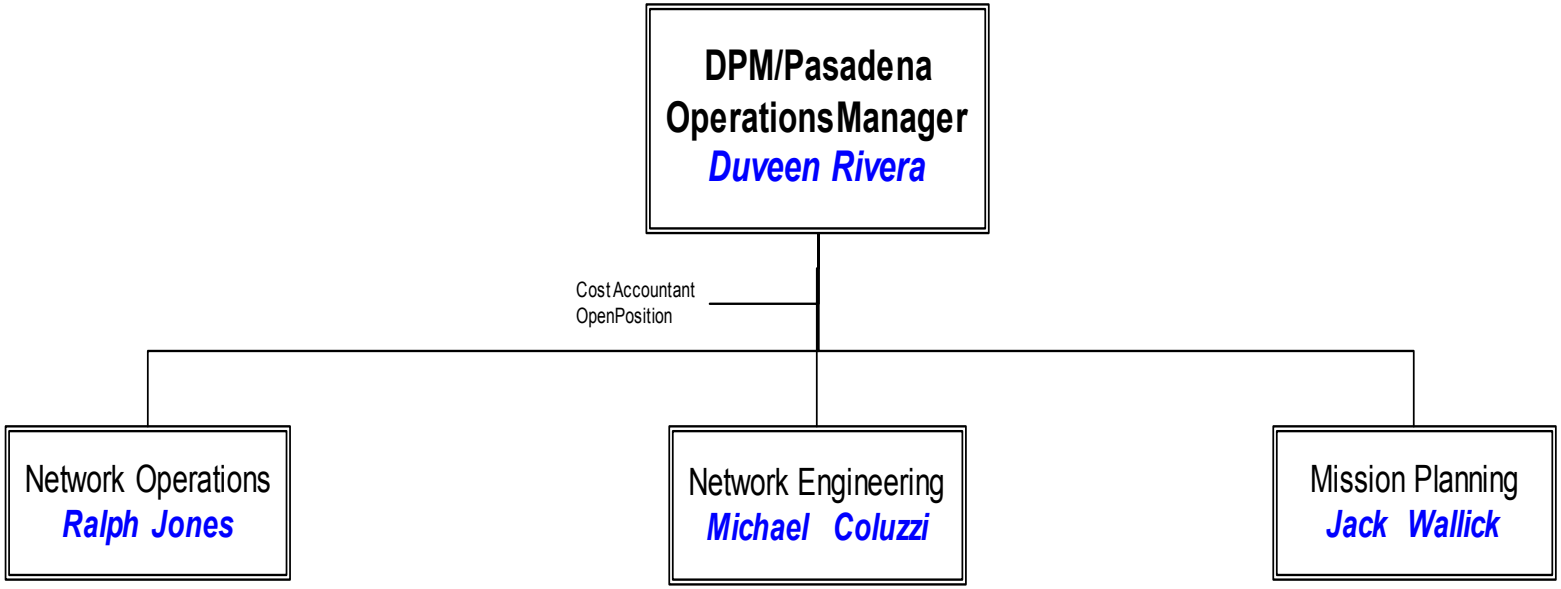
# ITT DSN Overview



# ITT DSN Overview

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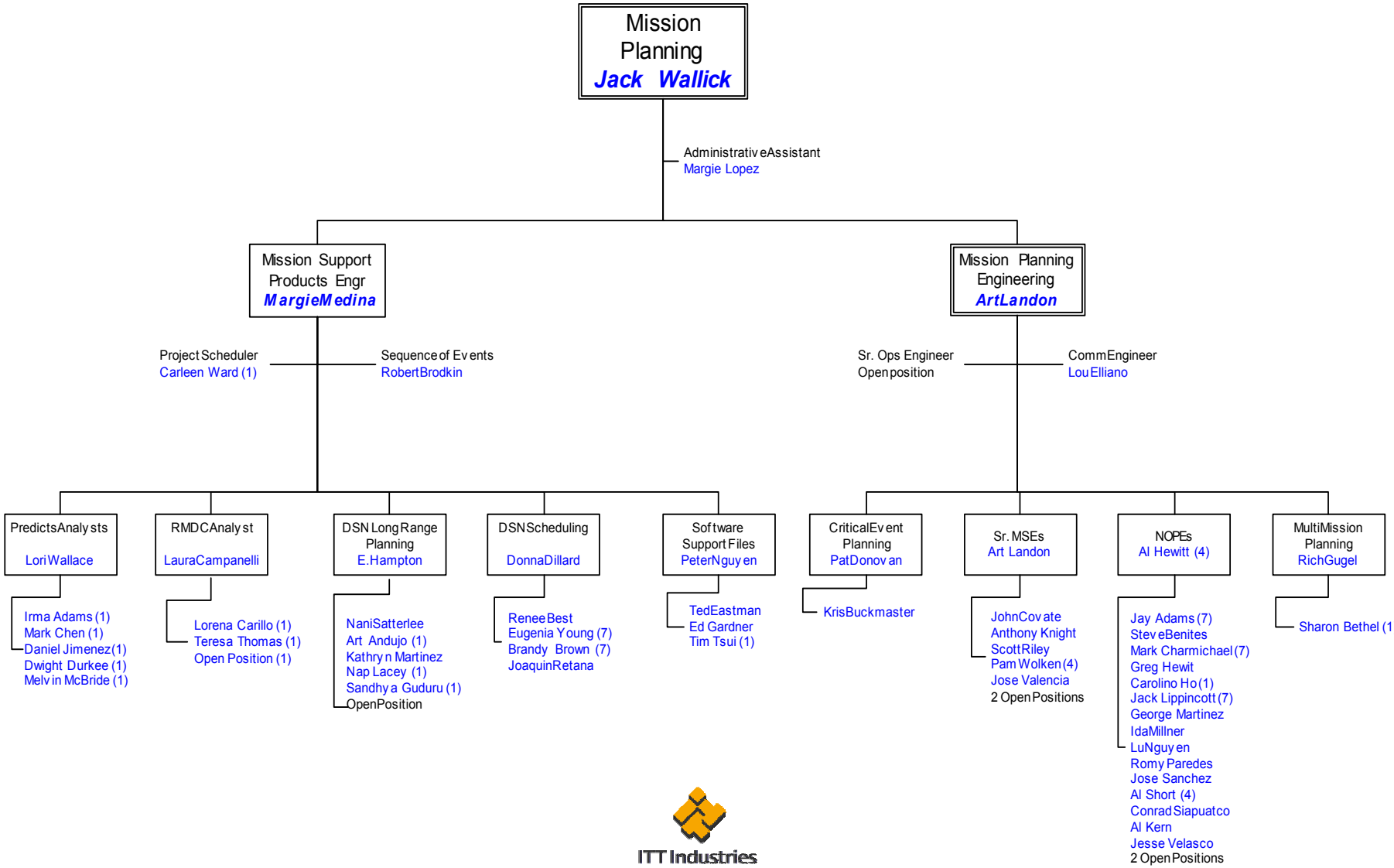


ITT Industries

# Contract Overview



- **Customer** JPL/NASA
- **Contract Type** CPFF, AF, Award Term
- **Value** $274M, up to $600M
- **Duration** 5 years, up to 10 Years
- **Employees** 462
- **Small Business** 25%
- **Subcontractors / Partners**


## Mission Responsibilities:

24/7 Operations & Maintenance, Systems Engineering, IT/Data Systems, Logistics, Sustainment/Modernization, Training, Security, Facility O&M, EH&S, Food Service/Lodging

ITT Industries

# Deep Space Network
## Operations and Maintenance

## Vision:

*Premier provider of operations, maintenance and modernization of ground and space network systems for space exploration*

## Mission:

*Operate, maintain, modernize and support NASA/JPL's Deep Space Network, delivering superior network performance*

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# ITT DSN Overview

## Network Engineering Primary Functions

1. *Provide the primary interface between DSMS Engineering and the Complexes*

2. *Provide all required Logistical Support necessary to maintain a high degree of Network Availability*

- **Network Engineering**
  - **Engineering**
    - Systems Engineering
    - Antenna and Facility Engineering
    - Software Engineering
    - Operations Engineering
  - **Logistics Support Services**
    - Configuration Management
    - Technical Documentation
    - Operational Databases
    - Logistics (PHS&T)

ITT Industries

# Mission Planning Primary Functions




- **Mission Planning Engineering**
  - Mission-Specific Planning for Network Operations and Critical Events
    - Critical Events planning
    - Test Plans
    - Training Plans and Training Implementation
    - Network Hardware and Software Configurations
    - Mission Procedures
    - Mission Event Readiness Review (DRD OPS001)
    - Network Operations Plans (DRD OPS002)
- **Mission Support Products Engineering**
  - Support Product Generation for all phases of Network Operations
    - Sequence of Events
    - Telecommunication Predicts
    - Radio Metric Predicts
    - Software Support Files
    - DSN Schedules and Resource Allocation Planning
    - 7-Day Operational Schedule
    - Validated Radio Metric Tracking Data
    - Radio Astronomy and Special Activities (RASA) Program
    - Network and Services Utilization Data (DRD OPS003)
  - Over 94,000 data products each month

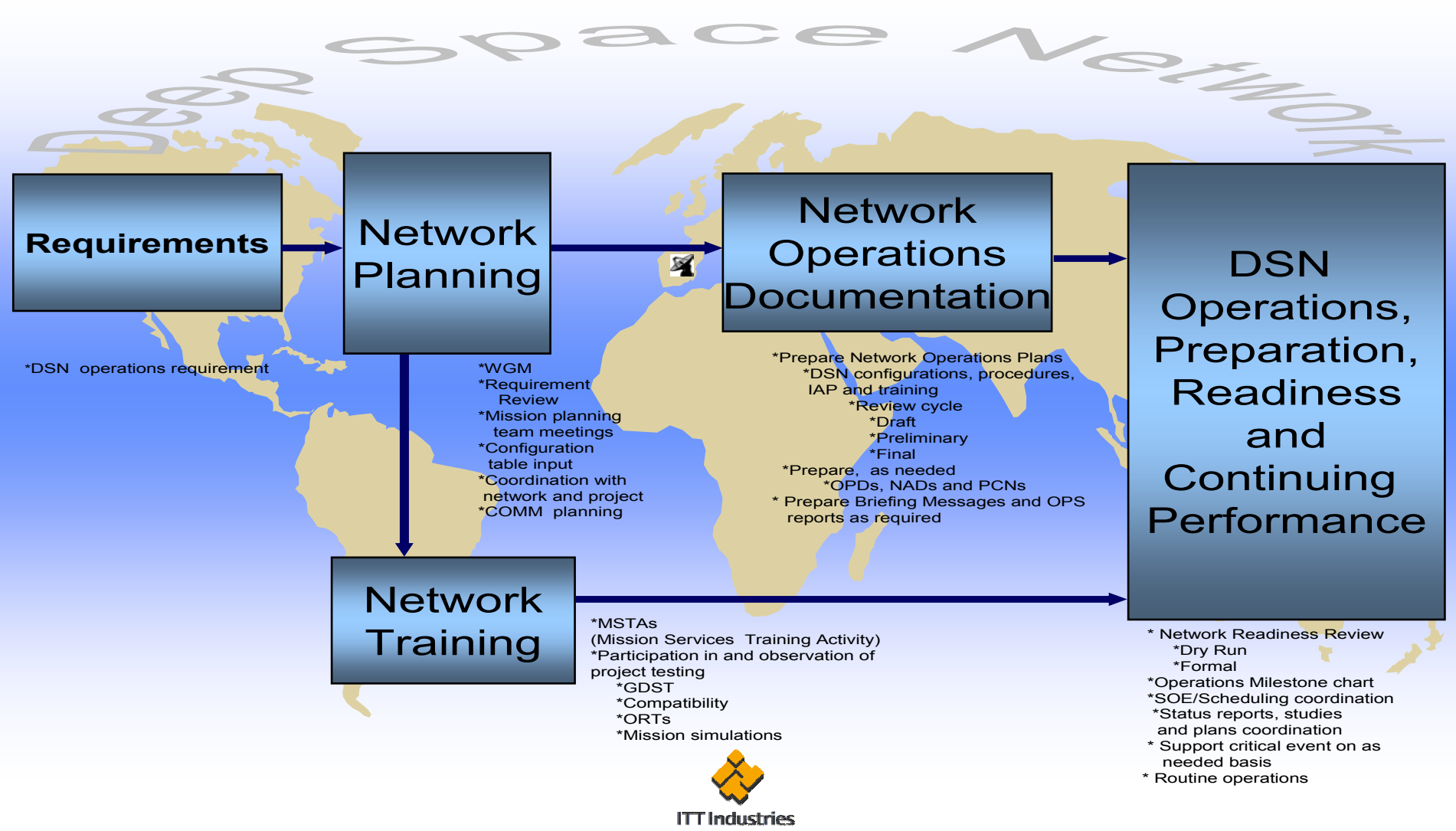
# Mission Planning Primary Responsibilities



- Support all DSMS committed projects
- Plan DSN operational support
- Assess DSMS readiness and report during Mission Event Readiness Reviews
- Perform Ground Communications System planning

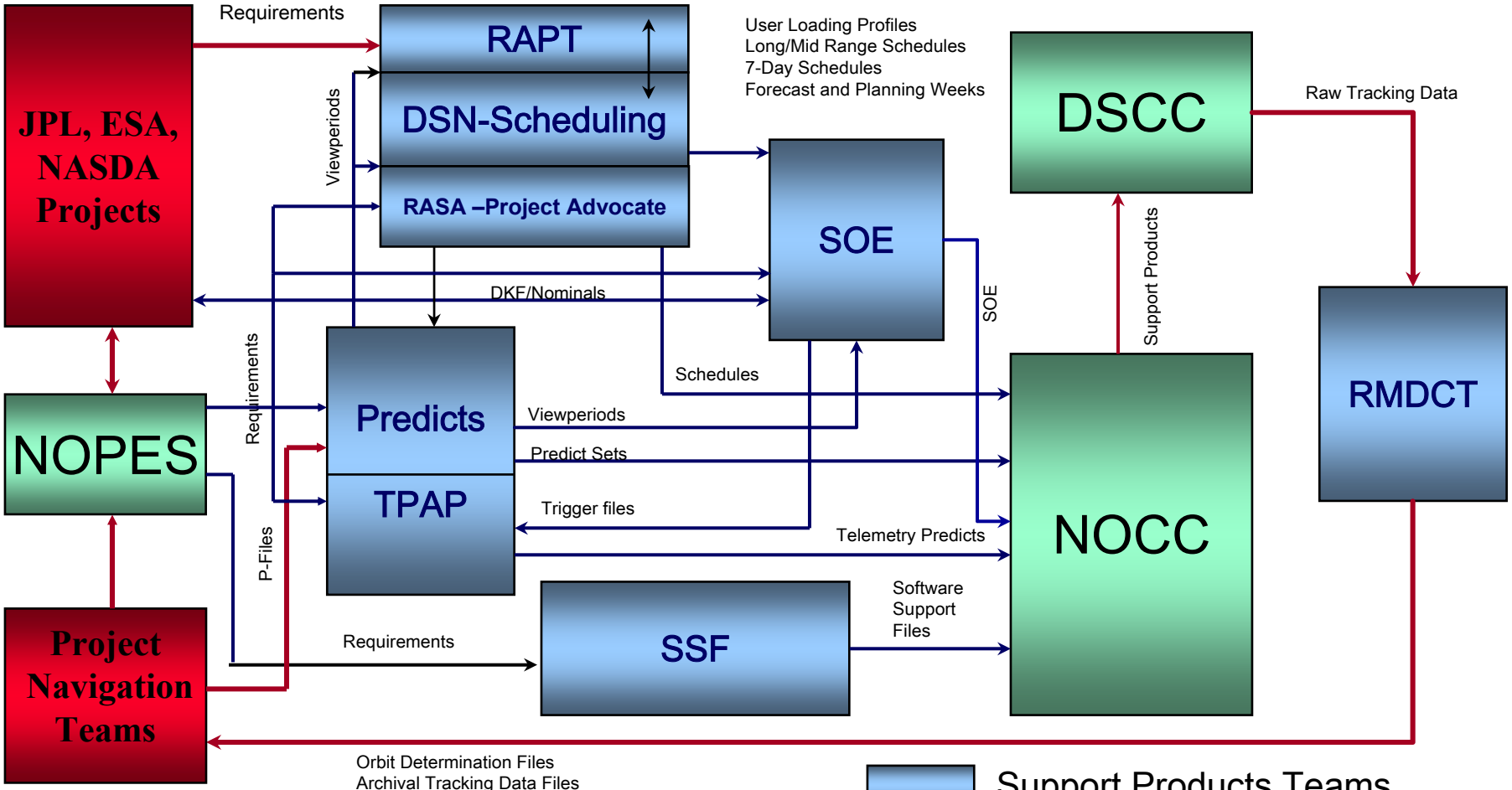
# Mission Planning Process Flow





# Mission Support Products Process Flow






ITT Industries

# Network Operations - DSOCC (NOCC & DSOT)



- **Operates all Deep Space Operations Control Center (DSOCC) elements**
  - Real-time operations 24 hours a day, seven days a week.
- **Overall network monitor, control, and analysis of real-time tracking operations**
  - Maintains continuous voice and data contact across the DSN
- **Coordinates and resolves real-time problems/issues**
  - Resolves asset contention issues arising in real-time
  - Coordinates Spacecraft Emergency issues in real-time
  - Alerts DSMS management to serious network problems.
- **Performs real-time level-zero data processing on DSN radio-metric, telemetry, command, and monitor data,**
  - Distributes these data to the flight projects
  - Front end operations of AMMOS (Advanced Multi-Mission Operations System)
- **Management and operation of data records system**
  - Gathers, assembles, stores, and distributes all necessary operational data records

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# DSN Test Facilities

- DTF-21, CTT-22, and MIL-71 support compatibility testing, development activities, and Flight Project special activities.
- DTF-21 replicates major portions of a DSCC and DSS
- CTT-22 : transportable trailer that contains the telemetry, tracking, command, ground communications, and monitor & control subsystems that normally support 26-meter, 34-meter, or 70-meter tracking activities.
- MIL-71 provides a pre-launch compatibility test configuration at the KSC in the period before the launch of the spacecraft.
- Provide DSN VLBI Correlator operation and maintenance


ITT Industries

# Plans and Updates 2005 - 2009


Jet Propulsion Laboratory
California Institute of Technology

David G. Morris

## AGENDA

- Mission Set Taxonomy
- 26m Subnet – Status and Plans
- 34m Subnets – Status and Plans
- 70m Subnet – Status and Plans
- Other Activities

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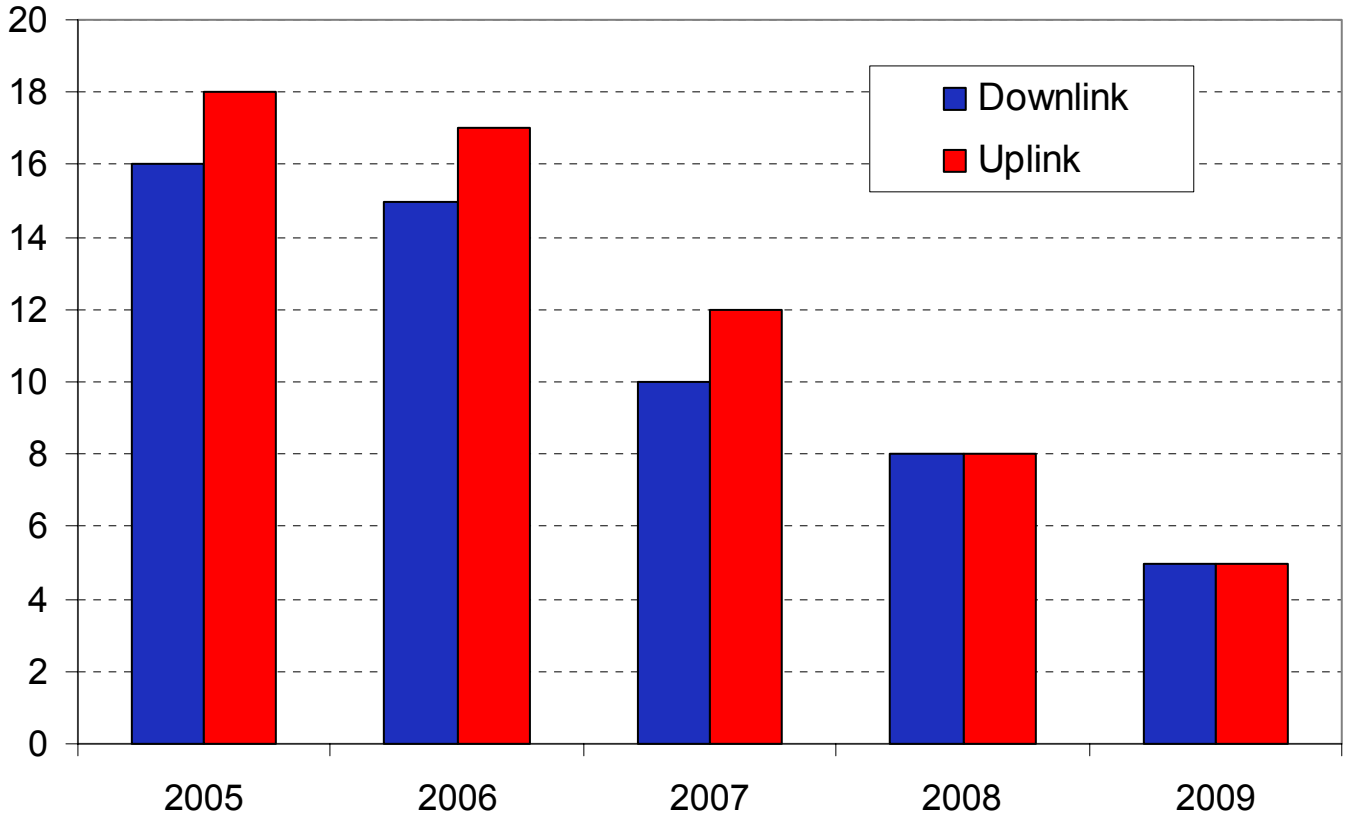
# Mission Set Taxonomy

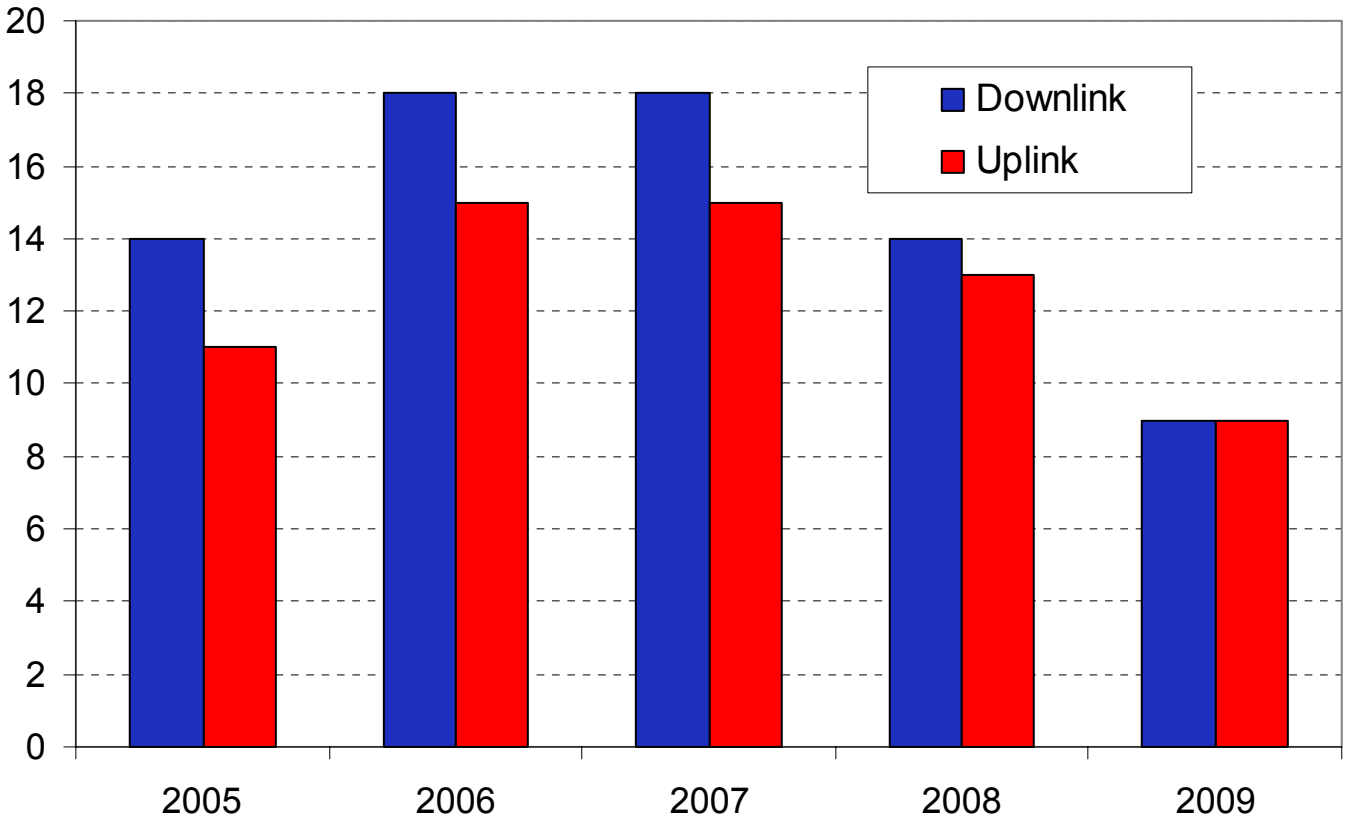
## S-Band Missions
## (not including emergency set)





# Mission Set Taxonomy

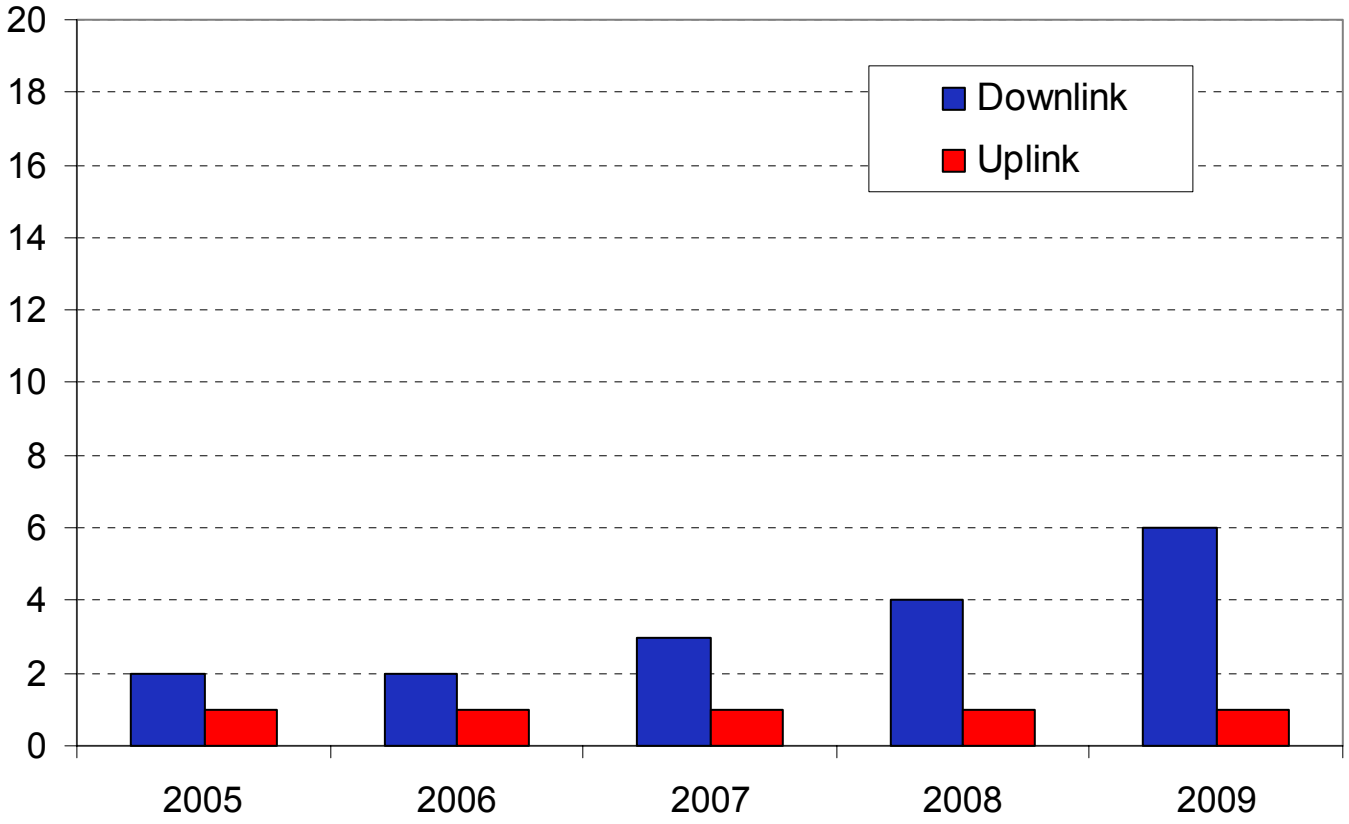

## X-Band Missions





# Mission Set Taxonomy


## Ka-Band Missions (including LRO)





# 70-Meter Subnet


## Planned 70-Meter Subnet Upgrade/Refurbishment:

| Task: | GDS | CAN | MAD |
|---|---|---|---|
| Antenna Controller Replacement | 2004 | 2005 | 2006 |
| Hydrostatic Bearing Assembly Upgrade | 2004 | 2005 | - |
| Microwave Switch Controller (USC) Replacement | 2004 | 2005 | 2006 |

- Updates:
  - S-Band High Power Transmitter Decommission Plan (WMAP)
    - DSS-63 (MAD) Capability Will Be Removed (FY 2005?)
    - System Spare Parts From DSS-63 Will Be Used to Provide Replacement Components to the Systems at DSS-14 (GDS) and DSS-43 (CAN).
    - Capability Will Be Maintained at DSS-43 (Canberra) for As Long As There Are Usable Spare Parts Available From Like Systems at DSS-63 and DSS-14

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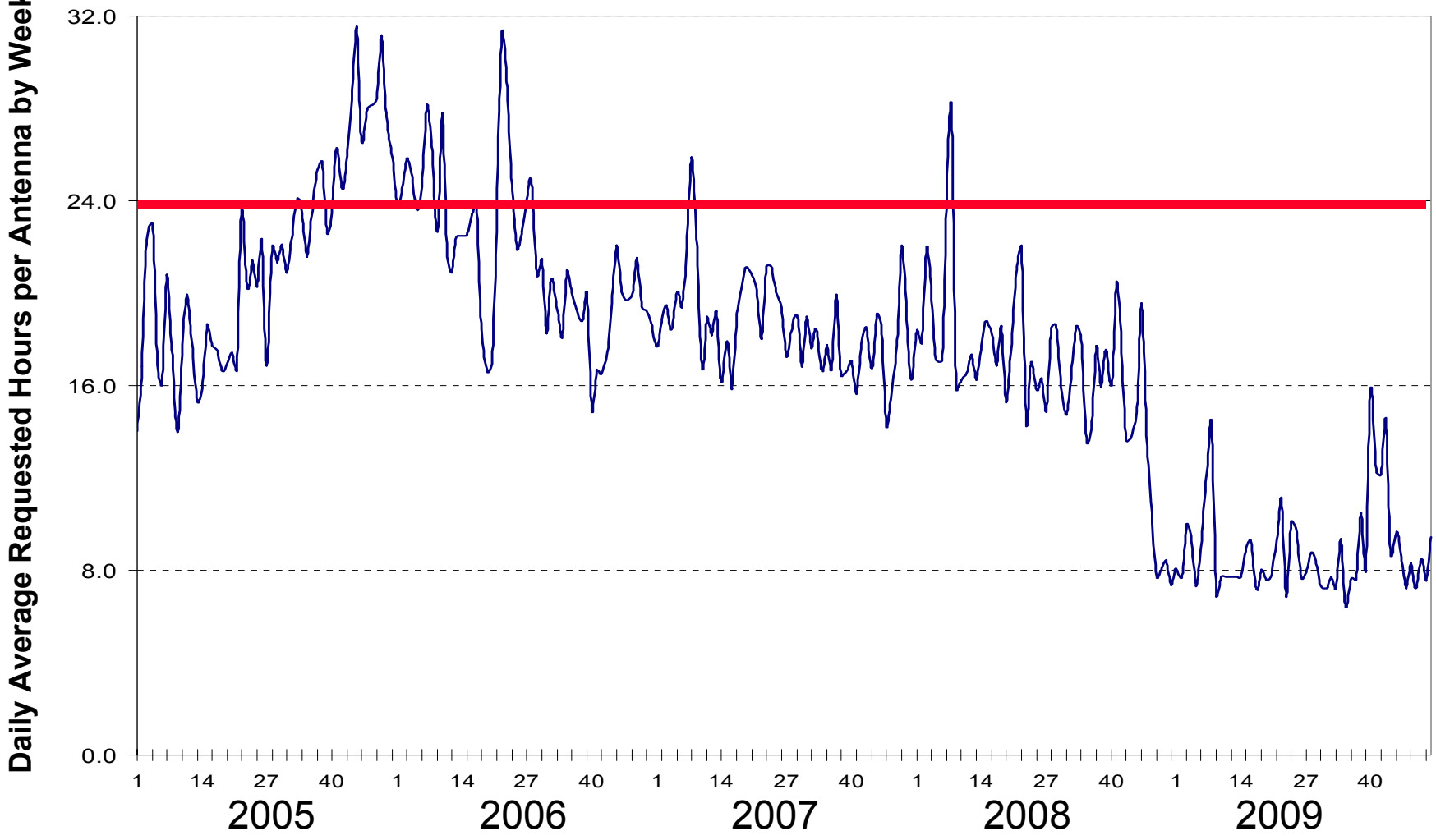
# 70-Meter Subnet

## Forecasted Requested Support: (Includes Maintenance and Pass Setup/Teardown)





# 34-Meter Subnets


## Planned 34-Meter Upgrade/Refurbishment:

| Task: | GDS | CAN | MAD |
|---|---|---|---|
| X/X-Ka Band Downlink Capability (34B) | 2006 | 2005 | 2007 |
| Antenna Controller Replacement (34H) | TBD | 2006 | 2005 |
| Microwave Switch Controller (USC) Replacement (34H) | 2005 | 2004 | 2005 |
| Microwave Switch Controller (USC) Replacement (34B) | 2005 | 2005 | 2005 |
| Life Extension (Azimuth and Elevation Axis Refurbishment) (34H) | - | 2004 | 2005 |
| Antenna Relocation (34H) | NA | NA | 2005 |
| Azimuth Idler Bearing (34B) | - | 2005 | - |

- Updates:
  - Implement Ka-Band (26 GHz) on 34BWG? LRO and JWST Need

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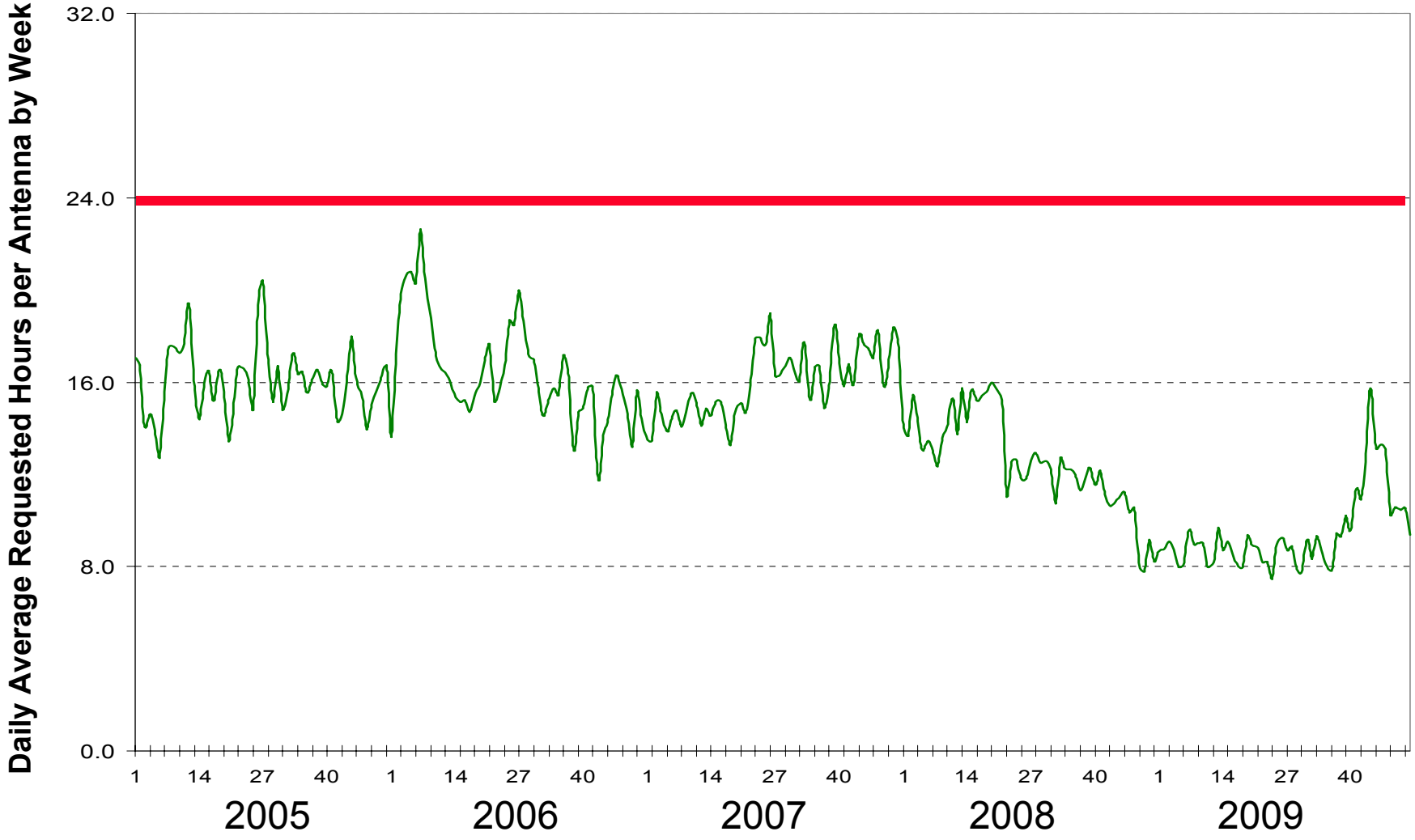
# 34-Meter Subnets

## Forecasted Requested Support: (Includes Maintenance and Pass Setup/Teardown)





# 26-Meter Subnet


## Planned 26-Meter Subnet Upgrade/Refurbishment:

| Task: | GDS | CAN | MAD |
|---|---|---|---|
| 26M Performance and Reliability Maint. | 2004 | 2004 | 2004 |
| Antenna Hydraulic System Upgrade | - | - | - |
| Network Simplication Project (TXR) (DSS-27) | 2005 | NA | NA |

- Updates:
  - Possible Closure of DSS-27 at End of FY 2006
  - Study on Possible Closure of 26m Subnet (End of CY 2008) Presented to Code S and GSFC Project Manager in February 2004.
  - Lunar Reconnaissance Orbiter (LRO) Communications
    - Presently Plan to Use S-Band and Ka-Band (26 GHz);
    - Goal is a 5 Year Mission Life (Launch ~ October 2008)
    - Potentially Continuous Support in 2008

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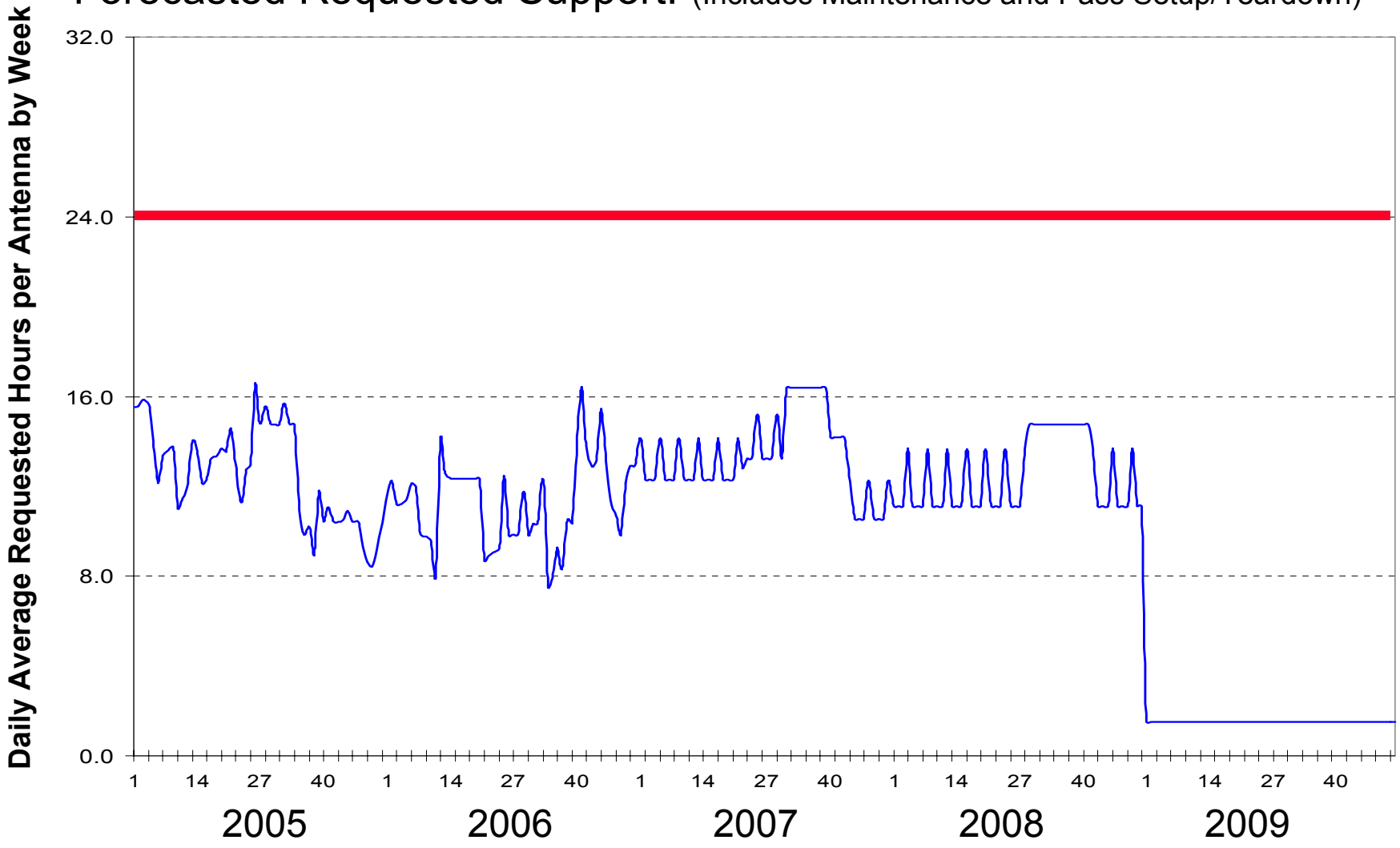
# 26-Meter Subnet

## Forecasted Requested Support: (Includes Maintenance and Pass Setup/Teardown)





# Other Plans


- **Other Activities:**
  - **Array**
    - Initiating Task for a 12 x 12m Prototype Array by 2008 (USA)
    - Many Issues to be Resolved (Frequencies, Uplink, etc.)
  - **Alternate Antenna Support**
    - Initiating Task to Upgrade Narrabri Array in Australia
    - Deep Space Ka-band by 2006 (Kepler, MRO, and MTO)
  - **Optical**
    - Optical Communications Test Lab (OCTL) Commissioned this year at Table Mountain in Southern California
    - DSN Technology Facility with planned support of the MTO Laser Communications Experiment (Uplink and Downlink)